VOLUME 11 NUMBER 4 APRIL 1985 $2.95

Creative Computing

THE #1 MAGAZINE OF COMPUTER APPLICATIONS AND SOFTWARE

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Concurrent PC-DOS
Hush 80 Printer
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Pre-school Software
SAT Packages
College Explorer

Technology: Detecting Defects in an IC

PCs Power Real-World Flight Simulators

An Interview With Astronaut Alan Bean

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Actual screen image

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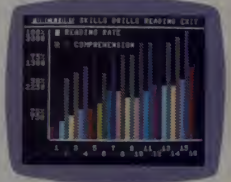

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The Cover: Goodbye, Little Red Schoolhouse. Our software schoolhouse embodies the educational theme of this month's issue. Exploring some of the latest educational tools are David Grosjean, son of Reviews Editor Paul Grosjean; Joshua Bicknell, son of Artist Eugene Bicknell, and Erin Henry, a friend of the family. Photography by Jeff MacWright. Schoolhouse by Peter Kelley.

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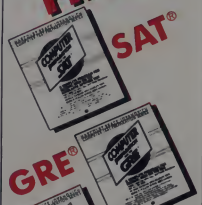

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INDUSTRY INSIDER

David H. Ahl

Commodore vs. Atari

Commodore and Atari are the two major competitors in the mass merchandiser arena. Sam Tramiel, president of Atari, and Frank Leonardi, vice president of marketing for Commodore, spoke out at CES about their plans.

Commodore is said to have notoriously bad dealer relations. Leonardi: "Commodore's relationship with its distribution is a normal one for the consumer electronics industry. Dealers are opportunistic, which is good, because it puts a lot of pressure on manufacturers to constantly strive for new things."

Atari is apparently trying to set high quotas for its dealers. Tramiel: "We are a very flexible company, and everything is negotiable." With respect to collecting from old accounts, "All the old business we inherited from Warner has been put aside and is totally separate from new business and new orders."

Commodore sees the channels of distribution becoming more similar. Leonardi: "The large computer chains (Computerland, Entre) do their merchandising in a way that is similar to the large mass merchants (K-Mart, Sears). They're looking for leaders to bring the customers in and step up items for the high end."

Atari sees youngsters as the key to selling home computers. Tramiel: "The kids know what to do with computers because they use them in school. It is a critical part of our marketing plan to sell to school systems. We've set up an education group within our sales organization to do that."

Leonardi on Commodore's competitors: "Apple and IBM."

Tramiel on Atari's future: "More powerful 32-bit computers, more aggressive pricing, and new electronics products using advanced audio/video technology."

Random Bits

Business Communications of Stamford, CT, forecasts 20% annual growth over the next five years in business microcomputers, 22% in peripherals, 38% in maintenance, 41% in communications, and 46% in software . . . AT&T claims its Unix System V is gaining support, particularly now that Microsoft has agreed to make its Unix-type system, Xenix, compatible with System V. Nevertheless, some software vendors are shying away from Unix because of AT&T's recently announced more restrictive licensing policy . . . Like Eagle Computer, another troubled PC clone maker sees China as salvation: TeleVideo Systems just signed an agreement with three Chinese companies to manufacture and market PC-compatible machines there . . . Looking for a winner in 32-bit Unix systems? Charles River Data Systems is shipping product and has just signed OEM deals with both Datapoint and Sord of Japan. Financial backers include EG&G, Analog Devices, Meditech, and now Datapoint.

Apple's fourth quarter earnings leaped nearly eightfold to a record $46.1 million on strong Christmas sales of the Apple II line . . . Also posting gains were IBM with a 17% earnings increase in the fourth quarter and DEC with a 37% gain. On the other hand, Kaypro's profits plunged by 97% while Tandy's fell 24% . . . Coleco posted a fourth quarter loss estimated to be between $65 and $80 million which it largely blames on the ill-fated Adam. The Odd Lot subsidiary of Revco reportedly bought Coleco's inventory of Adams; expected street price is below $300. Unbelievably, at CES Coleco privately showed a new computer said to be Apple compatible; development was said to be "close" to completion.

Keeping track of the players department: Corona, a vendor of IBM PC clones, has a manufacturing agreement with Daewoo, the huge Korean conglomerate. It also buys boards from Sanyo in Japan. On the other hand, Corona supplies finished computers to Sperry, Phillips, and Docutel/Olivetti . . . MicroPro and the Ass'n of Data Processing Service Organizations (ADAPSO) have filed suit against the Wilson Jones unit of American Brands, alleging infringement and unauthorized copying of *WordStar* and other Micro-

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INDUSTRY INSIDER

Pro software, ADAPSO originally announced that four "top 50" companies would be named in the suit but only American Brands (#77) was named . . . *Advertising Age* named **John Sculley** of Apple, Adman of the Year . . . If you didn't watch the end of the Superbowl, you might have missed Apple's single commercial. It showed a long line of drably dressed men and women in single file singing, "Hi ho, hi ho, it's off to work we go," as they marched over the edge of a cliff. Apple hoped that viewers would make the connection with IBM.

Analysts see the home computer market returning to more orderly growth in 1985. Infocorp projects 1985 sales of 5.7 million units, up from 4.4 million in 1984 and 3.4 million in 1983 . . . **Management Science America** is apparently negotiating to sell **Peachtree Software** to **McGraw-Hill**. Also for sale are MSA's Designware and Edu-Ware in which both **CBS** and **Scholastic** have expressed interest . . . A bankruptcy court judge has rejected a plan for **HES** to be acquired by Advant Garde after Microsoft and Spinnaker, two HES creditors, objected to the proposal . . . **The NY Better Business Bureau** has issued 15 challenges involving nearly 50 misleading and fraudulent computer advertising claims. The BBB challenged such claims as "Save $700" and "50% off" and also questioned "reduced" price sales that never end. A booklet, "Tips on Buying a Home Computer" is available for a SASE from the BBB, 257 Park Ave. South, New York, NY 10010.

On the horizon: A graphics entry device called **Space Tablet** which lets you draw in three-dimensional space . . . We hear that the top priority project at **Pioneer** is a writable videodisc for the home market . . . Peter Leppik, a 15-year-old hacker who had been accused of breaking into the computer files of a Minneapolis bank, recently helped police crack the disk protection code on a sex offender's electronic diary. Peter claimed the bank break-in was "accidental." . . . **Mother Jones' Son's Software Corp.** has an unusual way to combat piracy. Its sales agreements state that if the buyer copies the program illegally, "ownership of your eternal soul passes to us, and we have the right to negotiate the sale of said soul." The agreement adds, "Our attorneys will see to it that life on earth, as you know it, is completely ruined." . . . Immortalized? The on-board computer in the Star Fighter computer/videodisc game from Pioneer/ASCII is named the **AHL-1.** ■

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Alan Bean

Betsy Staples and John J. Anderson

Former astronaut Alan Bean: fourth man to walk on the moon; lunar module pilot; spacecraft commander of Skylab II, a mission which logged a world record 24,400,000 miles in flight; a man with over 7000 hours of flight time in the air, in addition to over 1500 in space who has flown 27 different types of military aircraft as well as many civilian airplanes; arguably a man with plenty of the Right Stuff. He has access to just about any computer you can name, and probably to a few you cannot.

What does he use computers for? "Not much," says the soft-spoken ex-Naval test pilot, with a Yeageresque twang. "They still can't do the things I want to use them for. As far as record-keeping goes, it's much easier to use a pencil and paper." I found myself agreeing with him. "Someday," he continued, "one will come around with the power I need for my work, and then I'll snap it up. Until then, I'll use a paintbrush."

Full-time artist Alan Bean: his work "Night Launch" hangs in the Smithsonian; at his first one-man show, 75% of his paintings were sold within the first 30 minutes; and virtually all of his work depicts the space frontier. "In the long view, I hope I come to be seen the way Charles Russell and Frederick Remington are viewed now—artists who experienced the frontier they painted. I'd like to be the artist who painted this generation's frontier, which, of course, is space."

Why paint a subject that has been so thoroughly documented photographically? "The moon photos were of course taken in very bright light. They lack the subtlety of color and sense of depth that I saw when I was there. I concentrate on these in my work. The lens of a camera and the eye of an artist are very different things."

Bean began studying drawing and painting in night school over 20 years ago while he was still a Navy test pilot. It remained a hobby until 1981, when he decided to devote himself to painting full time. "When I realized that most of us who actively participated in this incredible adventure and could tell all the stories first-hand would be gone in less than 30 or 40 years, I began to realize that if any credible artistic impressions were to remain for future generations, I must paint them now."

When will the artist move from acrylics on masonite to computer-generated art? "When a hi-res micro can simply handle three-dimensional data structures, and allow me to position the background, subjects, and 'camera,' as it were, I will use it to compose paintings." Even then, however, he will rely on his trusty brushes.

Bean is represented by Meredith Long and Co., 2323 San Felipe Rd., Houston, TX 77024. (713) 977-8186. His paintings start at about $4000. ■

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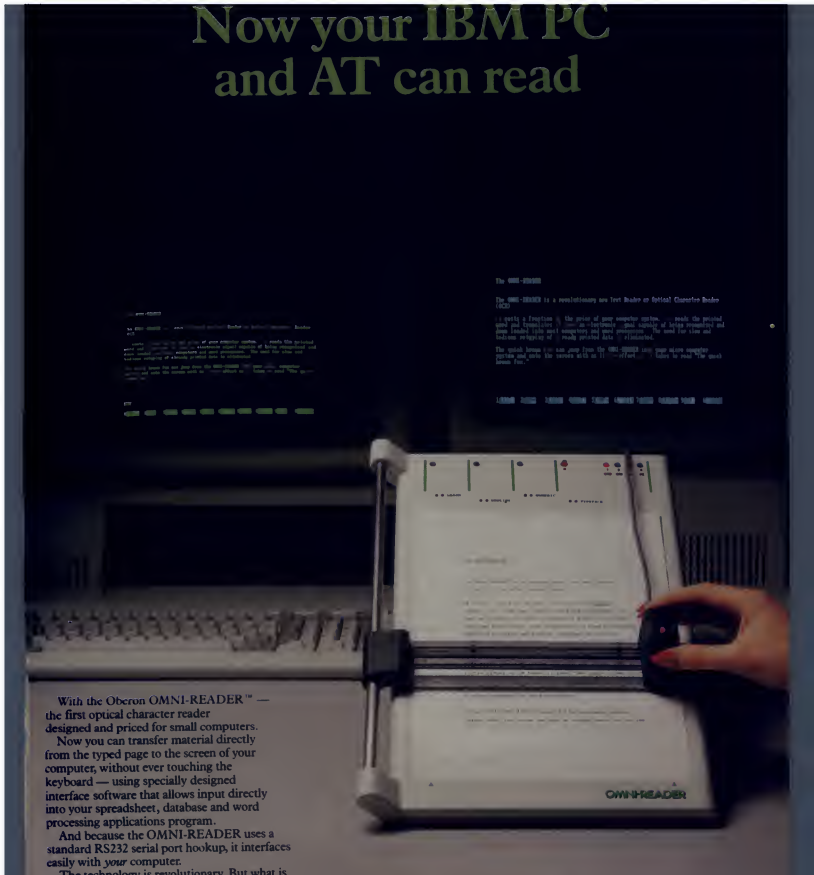

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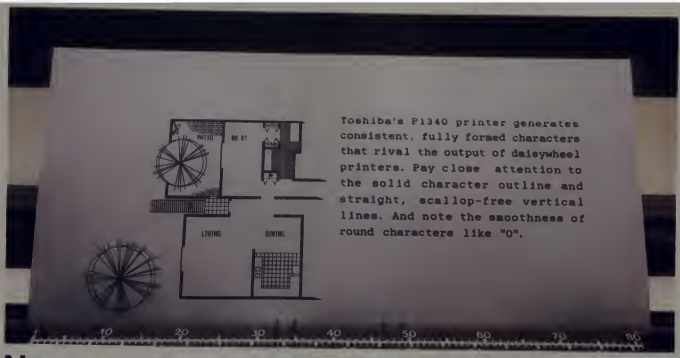

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PROFILES

Larry Jackel

Blue Ridge Summit, PA, a town of 300 people, is the site of one of the most modern book distribution centers in the country. On January 15 TAB Books opened the 35,000 square foot center to house and process orders for its 800 "how to" technical titles in the computer, electronics, aviation, automotive, home repair, robotics, and general science fields. President Larry Jackel, who purchased the company five years ago, says he has never been tempted to move it to New York City where most of the country's large publishers are headquartered. He enjoys "the no hassle way of life," and claims that none of the publishing professionals he has imported from the big cities has ever left Blue Ridge Summit. "We work harder here," Jackel says. "Our business is run more intensely; there are fewer distractions, and we are in tune with the world."

Arthur C. Clarke

Arthur C. Clarke has decided not to wait until the twenty-first century—or even 1985—to take advantage of the electronic cottage. The noted science fiction writer used a Kaypro computer to communicate with director Peter Hyams as the two collaborated on the screenplay of "2010," MGM's sequel to Clarke's "2001." For six months, the computers allowed Clark in Sri Lanka and Hyams in Hollywood to span 8000 miles and 14 time zones, exchanging lengthy letters almost instantaneously. The entire Kaypro-to-Kaypro correspondence has been collected and will soon be published in a book called *The Odyssey Files.*

Peter Payack

His unusual poems are familiar to readers of early *Creative Computing* magazines. His ponytail and ever-present smile are familiar to visitors who have frequented Creative Computing booths at computer shows in Boston. Peter Payack, who once called himself an "underground poet," has surfaced and even gone a bit commercial. His latest "concrete poem" is the Stonehenge Watch, a plastic pocketwatch case that opens to reveal a miniature, plasticized Stonehenge. For those whose knowledge of Druidic horology is less than complete, a user's manual is included for the $12.95 price of the watch. The watch, Payack's first successful commercial venture (the poetry anthology in fortune cookies never really caught on) is just one of the ways in which he has tried to make poetry accessible. Other media he has used include airplane wings, plants, buttons, and subway walls. ■

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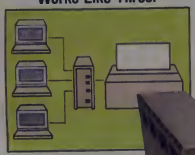

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SIDEKICK
NOTES
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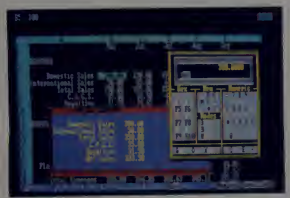
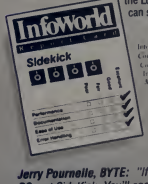


Here's **SideKick** running over Lotus 1-2-3. In the SideKick **Notepad** you'll notice data that's been imported directly from the Lotus screen. In the upper right you can see the **SideKick Calculator.**

All the **SideKick** windows stacked up over Lotus 1-2-3. From bottom to top: SideKick's **"Menu Window", ASCII table, Notepad, Calculator, Appointment Scheduler/Calendar,** and **Phone Dialer.** Whether you're running WordStar, Lotus, dBase, or any other program, SideKick puts all these desktop accessories instantly at your fingertips.



InfoWorld Report Card. 1984 by Popular Computing, Inc., a subsidiary of CW Communications, Inc. Reprinted from InfoWorld, 1060 Marsh Road, Menlo Park, CA 94025.

Jerry Pournelle, BYTE: *"If you use a PC, get SideKick. You'll soon become dependent on it."*

Garry Ray, PC Week: *"SideKick deserves a place in every PC."*

Charles Petzold, PC Magazine: *"In a simple, beautiful implementation of WordStar's block copy commands, SideKick can transport all or any part of the display screen (even an area overlaid by the notepad display) to the notepad."*

Dan Robinson, InfoWorld: *"SideKick is a time-saving, frustration-saving bargain . . . ."*

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BOOK REVIEWS

Careers, Logo, and the Marketplace

Russ Lockwood

Computer Literacy for Teachers: Issues, Questions, and Concerns edited by John H. Tashner. The Oryx Press, 2214 N. Central at Encanto, Phoenix, AZ 85004. Softcover, 150 pages, $27.50.

This compendium of 26 articles by educators, editors, and authors examines how teachers of grades K-12 should approach the use of microcomputers in the classroom. It presents differing opinions on computer curricula and details examples of how schools are implementing computer education programs.

The book leads off with a section discussing the influences, effects, and capabilities of computers in the classroom. Another section presents definitions of computer literacy, and a third examines exemplary computer programs from selected schools. Several appendices guide educators to numerous sources for more information.

Despite the obscene pricetag, this book presents an anthology of interesting views on a controversial topic. Teachers facing the dilemmas of classroom computerization will reap great rewards from this book.

Beginner's Guide to Microprocessors by Charles M. Gilmore. Tab Books, Blue Ridge Summit, PA 17214. Softcover, 218 pages, $9.95.

This introductory text explains microprocessor architecture, technology, and functions to the "uninitiated" electronics enthusiast. It explains microprocessor programming concepts and touches on techniques for software documentation.

The book starts with the development of the microprocessor, moves into a thorough explanation of the binary, octal, and hexidecimal numbering systems, and then examines the logic behind digital circuits.

The book then delves into the microprocessor programming instructions set, including data transfer, arithmetic, logic, branch, subroutine, and special commands. It reviews important characteristics of seven popular microprocessors—Intel 8051, 8085, and 8088/8086; Zilog Z80; MOS Technology 6502; and Motorola 6802 and 68000—and ends with suggestions for home experiments using microprocessors.

Charles Gilmore stuffs a lot of information between the covers. Indeed, perhaps too much, for he sometimes overwhelms the novice with detail. Still, the informative text and multitude of diagrams, circuit schematics, and other illustrations make the *Beginner's Guide to Microprocessors* an invaluable reference.

The Netweaver's Sourcebook by Dean Gengle. Addison-Wesley Publishing, Reading, MA 01867. Softcover, 326 pages, $14.95.

Telecommunications and local area networks (LAN) are hot topics in the microcomputer world. For those who have yet to discover their convenience, this book explains the concepts, terms, services, and potential of "micro networking and communications."

Dean Gengle does a fine job of deciphering the technical jargon and providing advice on designing your own LAN or micro-to-mainframe links. However, he goes beyond the hardware, software, and services to delve into the psychological and sociological implications of telecommunications.

On occasion, the book lapses into philosophical musings, but for networking facts, from both the technical and sociological viewpoints, *The Netweaver's Sourcebook* is an exceptional introduction.

Statistical Programs in Basic by Ronald D. Schwartz and David T. Basso. Reston Publishing, Reston, VA 22090. Softcover, 208 pages, $16.95.

Designed with the student in mind, this book provides step-by-step Basic programming instructions for solving statistical problems on a computer. It assumes you already understand statistics, and presents a problem, the appropriate algorithm, a full listing of a program, and several example exercises.

The "text" consists of REM statements within the programs, each explaining why a particular command is used. Topics include summation notation, data analysis, probability, probability distributions, estimation theory, hypothesis testing, regression and correlation, analysis of variance, and nonparametric tests.

Schwartz, a mathematics professor, and Basso, a manager of information systems development, provide a no-nonsense approach to statistics problem solving.

1-2-3 Run by Robert and Lauren Flast. Osborne/McGraw-Hill, 2600 Tenth Ave., Berkeley, CA 94710. Softcover, 295 pages, $16.95.

Many *Lotus 1-2-3* books tell you how to operate the program, in effect duplicating the manual. In contrast, *1-2-3 Run* provides cover-to-cover *Lotus 1-2-3* applications—41 of them—that you type into the program.

The book divides into two sections: business applications and home applications. Templates calculate cash flow analysis, accounting functions, sales summaries, expense logs, depreciation schedules, budgeting, and other financial functions.

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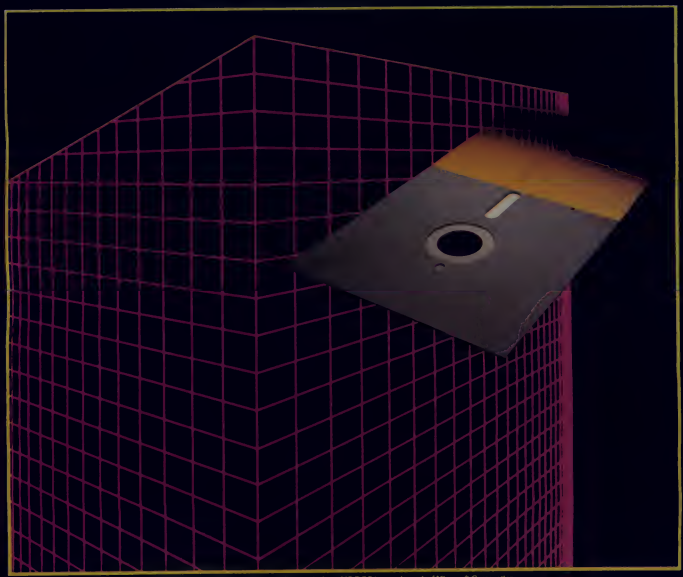

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BOOK BRIEFS

Careers

High-Tech Career Strategies for Women by Joan R. Goldberg. MacMillan Publishing, 866 Third Ave., New York, NY 10022. Softcover, 290 pages, $9.95

This mixture of advice and pep talk explores career opportunities for women in high-tech fields. It covers job descriptions, job-hunting, and climbing the corporate ladder.

Careers in Computers by Texe W. Marrs. Simon and Schuster, 1230 Avenue of the Americas, New York, NY 10020. Softcover, 152 pages, $8.95

This job-hunting guide includes a good helping of common sense along with a lot of fluff. The best part is the listing of addresses of high-tech companies and support organizations.

Resumes for Computer Professionals by Arthur R. Pell, Ph.D. and George Sadek. Simon & Schuster, 1230 Avenue of the Americas, New York, NY 10020. Softcover, 111 pages, $7.95

Top-notch how-to book helps professionals write a more effective resume. It includes 30 sample resumes, several cover letters, and the "10 Don'ts of Resume Writing." *Resumes for Engineers* is also available.

Better Resumes for Computer Personnel by Adele Lewis and Berl Hartman. Barron's Educational Series, 113 Crossways Park Dr., Woodbury, NY 11797. Softcover, 220 pages, $6.95

Excellent how-to guide presents professionals with an abundance of tips and techniques for writing effective resumes and cover letters.

Discover Your High Tech Talents by Barry and Linda Gale. Simon & Schuster, 1230 Avenue of the Americas, New York, NY 10020. Softcover, 137 pages, $8.95

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Logo

TI Logo by Harold Abelson. McGraw-Hill, 1221 Avenue of the Americas, New York, NY 10020. Softcover, 246 pages, $17.95

This book presents a potpourri of projects using Logo on the TI 99/4 and 99/4a.

Logo Fun by Pat Parker and Teresa Kennedy. Scholastic, 730 Broadway, New York, NY 10003. Softcover, 112 pages, $5.95

This inexpensive yet versatile guide presents projects and variations for Apple Logo, Terrapin/Krell Logo, Atari Logo, and TI Logo.

Commodore Logo by H. J. Bailey, T. H. Doran, and K. M. Brautigam. Brady Communications, Bowie, MD 20715. Softcover, 288 pages, $14.95

This introductory guide explores turtle graphics on the Commodore 64.

Nudges: IBM Logo Projects by Steve Tips, Timothy Riorden, and Glen Bull. Holt, Rinehart and Winston, 383 Madison Ave., New York, NY 10017. Softcover, 273 pages, $16.95.

Colorful beginner's guide to Logo on the IBM PC and PCjr suggests a multitude of projects.

Commodore 64 Tutor of Home and School by Julie Knott and Dave Prochnow. Scott, Foresman and Co., 1900 E. Lake Ave., Glenview, IL 60025. Softcover, 209 pages, $15.95

This handbook introduces Logo, Pilot, and Basic programming on the Commodore 64 to the beginner. It includes three sprite graphics and music programs.

Apple Logo: A Complete Illustrated Handbook by Drew Berentes. Tab Books, Blue Ridge Summit, PA 17214. Softcover, 376 pages, $13.95

This comprehensive handbook helps you wring the most out of Logo and your Apple II.

The Marketplace

The Elements of Friendly Software Design by Paul Heckel. Warner Books, 666 Fifth Ave., New York, NY 10019. Softcover, 205 pages, $8.95

This eccentric little book provides 30 practical principles for designing user-friendly software.

How to Document Your Software by Barbara Spear. Tab Books, Blue Ridge Summit, PA 17214. Softcover, 201 pages, $13.50

This handbook guides programmers in writing clear, organized manuals. It includes advice on preparing flow charts, block diagrams, and other graphics.

1985 Programmer's Market edited by Brad M. McGehee. Writer's Digest Books, 9933 Alliance Rd., Cincinnati, OH 45242. Softcover, 343 pages, $16.95

Glorious compilation of 700 microcomputer software publishers that use freelance material.

How to Copyright Software by M. J. Salone. Nolo Press, 950 Parker St., Berkeley, CA 94710. Softcover, 256 pages, $21.95

This invaluable reference details the procedures for copyrighting your programs and computer output. ■

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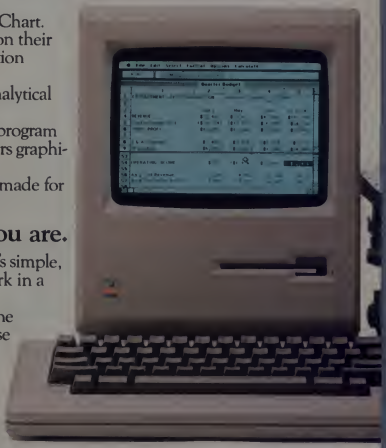

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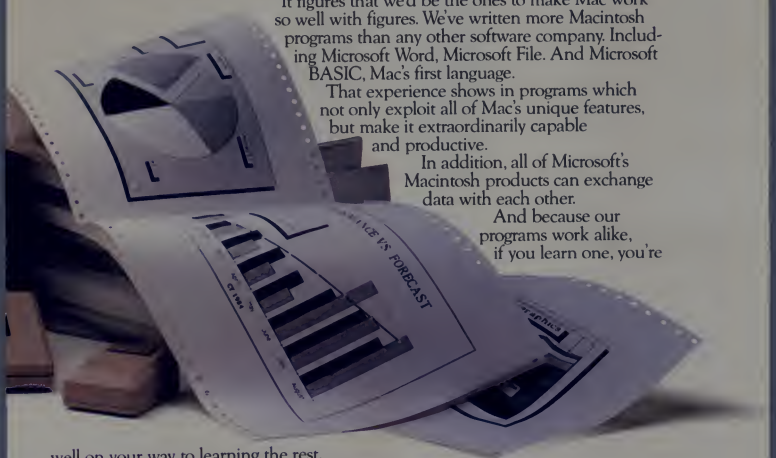

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IN REAL TIME

From sewing machines to space shuttles

Russ Lockwood

Most people recognize Singer as a manufacturer of sewing machines—not exactly hi-tech devices—yet some of Singer's less-publicized divisions design and manufacture a variety of high-technology products for the aerospace industry. Link Flight Simulation, which builds flight simulators, and Kearfott, which builds navigation and guidance systems, are not exactly household names, yet their products are crucial to the success of the Space Shuttle, Trident missile, B-1 bomber, F-16 fighter, Boeing 757 and 767, and numerous other civil and military aviation and aerospace projects.

Most aerospace companies, Link and Kearfott included, use mainframes and minicomputers for their programming, design, and engineering work. Microcomputers perform the more traditional office functions: word processing, spreadsheet analysis, and database management. However, Link and Kearfott are beginning to explore creative ways of applying the microcomputer to engineering problem solving.

The managers and task supervisors to whom we spoke at Link and Kearfott are enthusiastic about using microcomputers for engineering applications. They cite cost effectiveness over minis and mainframes and ease of use as specific advantages.

The latter reason is especially important. Austin Maher, Kearfott director for computer software engineering, points out that microcomputer operating systems are usually friendlier than their mainframe counterparts. Engineers can concentrate on solving problems rather than learning complicated command structures.

Another advantage is security. Russ Pepe, Link director of information resources, notes that many people have access to a mainframe, but a microcomputer can be physically isolated from unauthorized users.

The PC to Cessna Link

Link boasts that it is the leading manufacturer of flight simulators in the world. Indeed, its product list reads like

The single engine flight simulator from Link. The student sits in the cockpit at left and the instructor controls from the IBM PC.

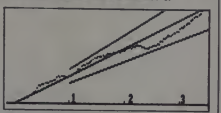

Figure 1. "Ace" Lockwood's erratic, but successful, landing.

a what's what in aviation: Space Shuttle, F-16 fighter, Boeing 767, B-52 bomber, Learjet, and AH-64 attack helicopter to name a few. These are top-of-the-line, multimillion dollar units with sharp mainframe and microprocessor-based visual systems. They precisely duplicate aircraft controls, including the ability to swivel and tilt in response to pilot actions.

On a more modest level, the newest flight simulator in the Link catalog mimics single engine airplanes. It features a fully instrumented cockpit, a visual system that operates roughly like a projection television, and a separate instructor station. The instructor station consists of an off-the-shelf IBM PC, joystick, Quadram Quadchrome RGB monitor, and Epson printer, hooked into an Aydin Graphics terminal.

The hard disk holds a database of maps, which can be edited to localize weather conditions and geography. The areas are stored using longitude and latitude coordinates. Project engineer Dave Tripp brags that the system can simulate any area in the world down to three-quarters of an inch.

As the student pilots the simulator, the instructor monitors the flight on the IBM PC. The instructor can introduce variables, such as nightfall, inclement weather conditons, and equipment malfunctions. The effects are faithfully reproduced in the cockpit and on the screen.

The keyboard of the IBM PC has custom keycovers with commands printed directly on them. The instructor merely presses a key to induce a change or begin a function. The programs are written in compiled Fortran with some assembly subroutines.

An especially nifty feature is called "snapshot." The instructor freezes a particular situation, such as a landing approach, with the snapshot function. Then, each time he presses the snapshot key, the student starts the simulation in that situation.

The joystick allows the instructor to change the position of the aircraft. To continue the example above, the instructor can call up the landing situation with the snapshot key and then change the heading of the aircraft with the joystick to simulate a different approach to the airport.

A printout (see Figure 1) from the Epson printer shows how the student fared in the simulation. The graphs display an optimum landing approach (center line) and acceptable limits (lines to either side of the center line). A dotted line indicates the student's actual approach.

A special combat simulation, between a student-controlled single engine plane and a computer-controlled F-18 jet fighter, is available (see sidebar). Yes, they did cripple the jet so it would not fly rings around the propeller-driven plane.

Potpourri of Applications

Kearfott is using microcomputers to help with engineering research on fiber optics networks, automatic data collection, and robotics.

Staff Engineer Michael Sottile is us-

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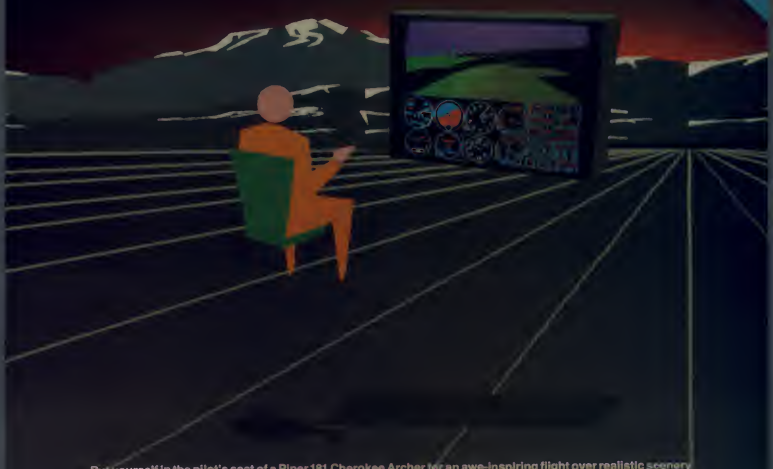

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ing a trio of IBM PC ATs to create a multiplex data communciations network using fiber optics. Multiplex networks with regular wires and cables are already used to interconnect workstations in the Space Shuttle and aircraft. Fiber optics will increase the speed and accuracy of communications.

Sottile chose the PC AT over other microcomputers because of its expandability, microprocessor speed, and IBM product longevity. The three microcomputers cost less than building a dedicated network from scratch—especially since no standards exist for 100MHz fiber optic communication networks.

The fiber optics cables attach to custom-made expansion boards (optical transmitters and receivers) that plug into the IBM PC ATs. Each computer has 256K RAM and uses the PC-DOS operating system. The input/output programming is done in assembly language; the main program in compiled Basic or Pascal.

Task Supervisor Frank Tamaro uses an IBM PC XT to collect and analyze test results of inertial navigation systems. Previously, a person collected 16 sets of data by hand and then punched the numbers into a calculator.

The navigation systems plug into dedicated test equipment, which is connected by cable to a custom-made expansion board in the PC XT. As the test equipment generates signals, the computer stores the data on the hard disk and performs the necessary calculations. A printer makes a hard copy.

Tamaro notes that the PC XT speeds up data analysis while saving many man hours of effort. It does not take coffee breaks and can collect data overnight during extended testing periods. Since the test results come back quicker, engineers can react faster to potential design problems.

Task Supervisor Herbert Rogall uses an Apple II Plus for robotics research and training. The computer connects to a commercially-available Microbot Inc. MiniMover 5 robot arm. Applesoft Basic programs control the arm.

In our demonstration, Rogall maneuvered the arm to stack three wooden blocks according to size. The computer stored the commands. Rogall then reset the blocks in their original positions. With the press of a button, the arm grabbed and restacked the blocks.

This apparently simple operation, picking up and placing objects, is the most common application of robotics,

The Apple-powered robot arm.

according to Rogall. Lessons learned on the Apple-controlled robot arm can be transferred to larger factory robots.

One for the Lawyers

According to some software companies, corporations are a hotbed of software piracy. Lotus Corp., for example, sued Rixon Inc. and Health Group Inc. for copying and distributing *Lotus 1-2-3* programs within their organizations.

Gus Raso, Kearfott manager of computer applications planning, who devised an anti-piracy program for the controller's office, contends that aggressive management practices are needed to protect the integrity of the division's data and equipment and to comply with the copyright laws. Under his plan, each floppy disk carries a copyright warning and a control number. In essence, the warning reinforces the idea that the program belongs to Lotus and data generated with the program belong to Kearfott. Spot checks are made to confirm that disks are where they belong.

Requiem for a Mainframe?

The trickle of microcomputers into the engineering labs of Kearfott and Link by no means marks the demise of the mainframe or the mini. High-technology products such as ring laser gyros and digital imaging systems require the speed, storage, and central location of a large computer.

However, progressive companies like Singer are learning that increases in computing power allow selected, hard-core engineering projects to be run on microcomputers. They find that use of personal computers results in large personnel productivity gains and that the smaller outlays for hardware are very cost-effective.

Thus, while traditional word processing, spreadsheet, and database functions continue to account for most microcomputer usage, creative engineers are capturing the power of the microcomputer for innovative engineering applications. If their enthusiasm for these machines is any indication, more and more microcomputers will soon find homes in engineering departments.

Incidentally, since this is our education issue, we asked what sort of career opportunities were available. Kearfott (1 Hughes Pl., Little Falls, NJ 07424) and Link (Binghampton, NY 13902), we were told, are always on the lookout for bright programmers and engineers. Half their employees fall into the engineering category, and a quick glance at salaries, benefits, and expansion plans indicates a thriving company. The Personnel Departments will be more than happy to look at resumes from *Creative Computing* readers. ■

Ace Flies Again

I've flown against Fokkers in Microsoft *Flight Simulator* and MiGs in MicroProse *F-15 Strike Eagle*, but neither prepared me for this mission on a Link simulator. Without radar or a wingman, I must shoot down an advanced F-18 jet fighter—with a single engine Cessna airplane.

Even worse, I am in a replica of a real cockpit, with yoke, throttle, rudder pedals, and a myriad of dials. This is certainly a far cry from a set of cursor keys or a joystick.

With blue skies above and green fields below, the engine drones on as I crisscross no man's land. Suddenly, a flicker of light catches my eye—sunlight reflecting off an F-18—and a spurt of adrenalin jolts me into action.

I throw the plane into a diving corkscrew. As I pull out, the tail of the F-18 appears just ahead of me.

I stalk him. Like a shadow I stalk him, all the while lining up the crosshairs on his tail. I fire. The rocket streaks toward the target, but the red glare comes from my eyes as the rocket explodes below the enemy. I yank back the yoke, pulling up the nose of my aircraft, and fire again. The rocket arcs toward the plane. My eyes trace its path. The enemy starts to turn. And in that brief instant of achievement, when time stands still, the rocket destroys the intruder.

Thumbs up. Mission complete.

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TELECOMMUNICATIONS TALK

The Reader's Guide goes electronic

Corey Sandler

As a writer, I've had a lifelong love affair with words and books and magazines. The perfume of my youth was the musty odor of the backshelves of libraries.

There were rainy Saturdays when I would read the encyclopedia for entertainment, or browse through the *New York Times Index* for 1938, or pore over the latest newsprint edition of the *Reader's Guide to Periodical Literature.* By age 13 or so, I was on intimate terms with both the Dewey Decimal System and the batting averages of the entire Los Angeles Dodgers roster.

(In adulthood, I fulfilled one of my deepest fantasies when I dated the children's librarian in the town where I was working. And I can still remember the unknowing jealousy I saw in the eyes of some of the fourth graders when I came to pick up L.S. after work.)

And now I am a writer in a world where most of my words are created without benefit of paper, and where some of them never make contact with printer's ink. There's a certain loss of tangible accomplishment when all that I can show for a day's work is four entries in my MCI mailbox. Sometimes I make printouts just so I can have something to point to.

However, the electronic world works both ways. (Full duplex, you might say.) More and more of the world's stored intelligence is becoming accessible to computer users at work and home. I can consult hundreds of newsletters over NewsNet; I can read from thousands of technical papers and journals on BRS; I can look up a term or a name in an encyclopedia on The Source, and I can find out everything I ever wanted to know about a company's finances from Dow Jones.

And now my old friend the *Reader's Guide to Periodical Literature* has joined the electronic world. Publisher H.W. Wilson Company, one of the hoary veterans of database technologies (they called them indexes way back when) has put the *Reader's Guide* and 11 of its other offerings on the computer.

H.W. Wilson is the descendant of the lifelong work of one Halsey William Wilson, who was, according to *The Saturday Review*, to "bibliography what Webster is to dictionaries, Bartlett to quotations."

> **Halsey William Wilson was to "bibliography what Webster is to dictionaries, Bartlett to quotations."**

Old H.W. started his company in 1889 at the University of Minnesota, when he and his roommate bought a printing press and began printing syllabi for professors and selling books. The small business developed into a bookstore, and Wilson determined that his biggest problem in serving his customers was the lack of a database (err, index) of available books and publishers.

In 1898, Wilson began publishing a monthly listing of new and recent books, calling it the Cumulative Book Index. Entries were listed by author, subject, and title in the same index, an organization that was unique at the time. Wilson also found a way to update his database quickly. Since entries consisted of lines of metal type, Wilson treated each line as if it were a card in a library catalog. New entries were inserted among the earlier lines of type.

The CBI was a success, selling a respectable 300 copies at $1 each in its first year.

Librarians also began to sign up, and in 1901, Wilson added the first issue of *Reader's Guide to Periodical Literature*, indexing seven magazines.

One policy started by Wilson and continued to this day involves a spreading of the economic burden among libraries large and small, rich and poor. Clients were billed on the basis of the amount of use a library could make of a publication. Larger libraries paid more, in other words.

In November of 1984, Wilson's company went electronic with Wilsonline. When last I checked, they were offering the following indexes on line:

- Applied Science and Technology Index, indexing every article in 336 periodicals on aeronautics, space science, chemistry, energy, engineering, marine technology, meteorology, petroleum and gas, physics, robotics, telecommunications and more;
- Biological and Agricultural Index, with listings from 204 English-language publications in life sciences with coverage of agriculture, animal husbandry, biology, botany, genetics, cytology, zoology and more;
- Business Periodicals Index, indexing 304 publications;
- Book Review Digest, with excerpts from and citations to more than 6000 reviews of current adult and juvenile fiction and non-fiction each year;
- Cumulative Book Index, with listings of between 50,000 and 60,000 books each year with full library information including author, title, subtitle, subject, cross-reference, illustrator, price, publisher, and other information;
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- Readers' Guide to Periodical Literature, including 186 magazines, *Creative Computing* among them;
- Library of Congress/MARC;
- Journal Directory File;
- Publisher's Directory File, and
- Name Authority File.

The database searching procedures for Wilsonline are quite complete, and a bit complex. Searches can include Boolean Operators (and, or, and not); various truncation symbols for wildcard searches, and searching using qualifiers based on more than 25 elements of listings. For example, books can be searched on the basis of the author's name, the ISBN number, the Library of Congress number, the Dewey Decimal number, the publisher's name, and other categories.

In coming months, the rest of the Wilson indexes will come on line: Art Index; Bibliographic Index; Biography Index; General Science Index; Humanities Index; Library Literature, and Social Sciences Index.

As mentioned, old H.W. would feel right at home looking at the pricing schedule for Wilsonline; many libraries would also understand it right away. It took a mere mortal like me a bit of time, but basically the schedule has four different classes of subscription and ten discount rates.

The lowest charge—from $32 to $50 per hour, depending upon which index is being consulted—goes to institutions or individuals who are already subscribers to the printed index being searched. The highest rate, $65 per hour, is charged to non-subscribers to any Wilson product. You can bring down the price by paying into an account in advance of use—putting $2400 down drops most rates by as much as $10 per hour. Access to Wilsonline is through Tymnet or Telenet, and any capable telecommunications program should work. Expect to pay an additional $8 or so per hour for telecommunications.

Wilsonline maintains a toll-free phone number for information about its services. The number is (800) 367-6770. In New York State, call (800) 462-6060. The mailing address is: H.W. Wilson CO., 950 University Ave., Bronx, NY 10452. ■

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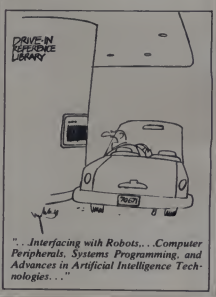

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Morrow Pivot

David H. Ahl

The Morrow Pivot is a compact, totally portable MS-DOS computer with single or dual 5 1/4" floppy disk drives, 16-line LCD display, built-in modem, and serial and parallel ports. Both the user interface and manuals—particularly the Owner's Handbook—are exceptionally friendly, reflecting in large part the friendly but no-nonsense attitude of company founder and president, George Morrow.

On the opening page of the Owner's Handbook, we read, "If you're someone who holds manuals in contempt as a matter of principle, at least familiarize yourself with the contents of the first section. It's short, and there are lots of pictures." With an opening like that, how can Pivot miss?

What You See

In contrast to the almost universal use of light beige or gray on computers today, the Pivot is an ominous flat black. An adjustable black carrying strap hooks to the top so you can more easily heft this 9.5 lb. unit. It measures 13" wide by 9.5" high and 5.6" in depth closed or 13" open (keyboard folded down).

On the left side, we find a battery pack compartment, on/off switch, AC adapter connector, and LCD viewing angle dial. On the back are a serial RS-232 connector, parallel printer connector, and modular phone jack. The right side houses one or two disk drives. The AC adapter is not one of those little 9-volt battery eliminators, but an industrial duty (15 volt, 2.5 amp) power supply about the size of a small cigar box. The rechargeable battery pack itself is also a monster, although that is to be expected for a battery that will be powering one or two 5 1/4" disk drives. Battery life is said to be about four hours (depending upon use of the disk drives) and recharge time is eight hours.

The keyboard has 62 full-stroke keys. The action and feel of the keys are

Hardware Profile

Name: Morrow Pivot **Type:** Portable computer **CPU:** 80C86, 3.33 MHz
RAM: 128K expandable to 640K **Ports:** Parallel, serial, telephone
Keyboard: 66 keys, 14 pressure sensitive function/icon keys
Display: LCD, 16 lines x 80 characters; 480 x 128 pixels
Disk Drives: One (or two) 5 1/4", 360K **Modem:** 300 baud direct connect
Battery: Rechargeable, four-hour life **Dimensions:** 13" x 9.5" x 5.6", 9.5 lbs.
Documentation: Six user's guides and manuals **Operating System:** MS-DOS
Bundled Software: MS-DOS and Utilities, NewWard
Summary: Truly portable MS-DOS computer with 5 1/4" disk drive and modem; operating system overlaid with several nifty extras.
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virtually identical to the Model 100. Also like the Model 100, the keyboard lies practically flat; we had no trouble typing on it, but people who like a sloping keyboard will not be enamored of it. Because there are fewer keys than many other MS-DOS machines boast, many of the keys on the Pivot do double duty when coupled with the SHIFT or CONTROL key.

Above the keyboard is a touch panel with ten function control keys (F1 to F10) and four icon keys. These icon keys are unique to the Pivot, and most of them function without booting a disk or MS-DOS. When you turn the computer on, the display shows a calendar page with the date and time on the left and a world map on the right. If you are working on something else, the Clock/Calendar icon will return you to this opening display. From it you can check the time in a foreign time zone—a handy thing for that occasional phone call to Europe or Tokyo.

The Modem icon turns the Pivot into a terminal for calling databases like The Source and CompuServe or other computers. After you enter a phone number, the Pivot dials it automatically.

The Calculator icon activates a ten-key calculator, the display of which pops up in a window to the left or right of the screen. This is a four-function, 16-digit calculator with a few added goodies (compared with a pocket calculator). For example, you can set the number of decimal places, you can ask for rounded or truncated answers, and you can swap the sign of an entry.

The Diskette icon will automatically boot a disk. It is also used to return to a disk-based program from the clock/calendar or calculator mode of operation. Another use of this function key is to scroll the display—a feature required when you use software designed for a 25-line display on the 16-line display of the Pivot. Essentially, the 16-line display becomes a window on the full-screen 25-line display.

Speaking of the display, it measures 9" x 2.4", a much higher width to height ratio than a standard CRT. Characters are formed within a 5 x 7 pixel matrix with one pixel between letters horizontally and vertically. Descenders on five lowercase letters occupy the horizontal space, a common practice on LCD screens but one that definitely does not enhance readability. For graphics, a matrix of 480 x 128 pixels is dot addressable.

The front bezel is scored for a 25 line x 80 character LCD screen, and the manual mentions it in several places. Presumably it is coming in the future, but for now only 16-line models are being delivered.

The LCD screen has a fixed tilt of 20 degrees, satisfactory for some room lighting conditions, but not others. We eventually propped the front of our Pivot on a book to give the screen a tilt of 32 or so degrees which we found a considerable improvement. We understand from Morrow that in the future the Pivot will be shipped with a backlighted screen. This should lead to excellent legibility at the standard tilt angle.

Morrow is not a giant in the industry, but it is a sensibly managed company that has managed to survive for ten years.

What You Don't See

The heart of the Pivot is an 80C86 CMOS true 16-bit microprocessor operating at 3.33 MHz. It ran our standard Basic benchmark in 26 seconds—about 30% slower than desktop PC clones running at a clock speed of 4.77 MHz.

The basic Pivot is equipped with 128K of RAM and can be expanded to 640K. Internal ROM, which includes the icon software, is 16K. A small portion of the RAM (up to 16K) which contains the time of day, date, appointment calendar, and phone directory is permanently backed up with a small built-in battery said to have a two-year life.

The double sided, double density disks are formatted to the nine sector-per-track IBM standard and hold 360K each.

The Pivot comes with a 300 baud, auto dial, direct connect modem built in. If you want more speed (1200 or 2400 baud), the serial port is configured for connection to an external modem. The Pivot software cannot handle an external modem for file transfer; the manual advises buying a separate software package such as *Crosstalk* or a modem/software package combination.

What You Get

The Pivot comes in a big box which contains, in addition to the computer itself, MS-DOS and *NewWord* disks, a 178-page Owner's Handbook, a Microsoft MS-DOS User's Guide and Programmer's Reference (a rare inclusion—great for systems programmers, meaningless to end users), a Microsoft Debug Utility manual, a monster (400+ pages) *NewWord* User's Guide and 55-page supplement, a four-page instruction sheet on how to set up *Lotus 1-2-3* for the Pivot, and a free membership form for the on-line Official Airline Guide (saves $50).

The version of MS-DOS included with the Pivot is 2.11. The disk includes 16 utility programs such as Diskcopy, Link, and Format. We found we could also load standard IBM PC-DOS and MS-DOS (Compaq flavor) but not everything would work correctly; thus we recommend you stick with the furnished disk.

We had problems running several PC packages, some because of the 16-line display. Others such as *Electric Pencil* (which has run on every clone to date) just hung up the machine completely. On the other hand, by following the provided instructions we got *Lotus 1-2-3* to run without a hitch. However, you cannot view graphics on screen. The only way you can get a graph is to define it and save it with /GS, and then print it on a printer or plotter with the PrintGraph program.

NewWord is a word processing package written by some MicroPro defectors. It is similar to *WordStar* in concept and execution, but it has many advanced features. If you like *WordStar*, you'll love *NewWord*; if you hate *WordStar*, you might be neutral about *NewWord*.

NewWord has four levels of on-screen help. You probably won't be happy with the highest (default) level since it takes up nine of the 16 lines of the display, but the others are very helpful.

NewWord supports a wide range of printers and lets you, with some small difficulty, use all the custom print features of whatever printer you have connected. It prints mailing labels according to any conditions you specify such as a range of zip codes or all addresses except Newark, NJ. Conditionals can also be used for inserting selected paragraphs (for example, insert paragraph 3 if &PET& = dog).

Neither IBM Basic or BasicA (GW Basic) runs on the Pivot. However, Basic

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for the Compaq (and, we assume, other clones) runs without any problems. Curiously, Basic disables certain of the built-in functions such as Prt On (echoes the screen to the printer), Page Up, and Page Down, but not others. For example, the Print Screen, Home, Calculator, and Window Scroll keys worked fine. Frankly, we can't see much need for the deleted functions; it just seemed strange that they didn't work. Although the Basic graphics commands work, we recommend not using them as the high width to height ratio of the screen coupled with only 16 lines produces some unwanted effects.

With the Pivot, as with any other computer, our standard caveat holds: be sure to try out the software packages you want to use and see if they run before you buy.

Should You Get One?

Is a Pivot for you? Pros: it is truly portable, has 5 1/4" disk drives, runs MS-DOS, has a nifty icon touch panel, and is state-of-the-art without pushing unproven new technologies. Cons: the LCD screen is not suitable for certain lighting conditions (although the backlighted screen will fix this), 16 lines require compromises when running software designed for 25 lines, and not all PC software runs on the machine.

Morrow is not a giant in the industry, but it is a sensibly managed company that has managed to survive for ten years—a commendable feat in an industry where three years seems more the norm. The company has a good reputation with customers and dealers alike; this bodes well for continuing support of the Pivot even though, incidentally, it is not manufactured by Morrow.

Should you get one? If you need its capabilities, it's the best buy in town. ■

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CIRCLE 134 ON READER SERVICE CARD

A 68000 muscle machine that also does some pretty good impressions

Dimension

John J. Anderson

It is a fact: everything *is* bigger in Texas. That does, of course, include aspirations. For some time now we have reported on the aspiring Texan component of the microcomputer industry, represented by leaders such as Tandy, TI, Houston Instrument, Datapoint, and others. In a land where hats often take ten gallons and airports are sometimes five miles long, aspirations stand tall. And the aspirations of the Dimension 68000, from Micro Craft of Dallas, represent a tall order indeed.

Candide's Computer?

Imagine a micro that was the best of all possible worlds. Basically a 68000-based muscle machine, it would represent sheer computing power. And built around co-resident coprocessor boards, it would also optionally run IBM MS-DOS software, Apple II software, CP/M software, and Unix-based software. You wouldn't have to choose between standards. That decision would no longer be necessary. There would be no reason to buy another machine.

That, in a nutshell, is the philosophy of the Dimension 68000. There is, however, more to this machine than merely a nutshell, as we shall see. But first the specifics. The Dimension system includes 256K RAM, expandable to 512K, dual half-height, single density, double sided drives, CP/M 68K, based on the 68000 CPU, Basic, a C Compiler, 68K assembler, diagnostics, and utilities. It comes with an NTSC output, a Centronics standard parallel port, an RS-232 standard serial port, and a joystick port.

Ten-Gallon System Unit

As one might guess, a system unit designed to enclose a 68000 along with a maximum of four co-processor cards, while leaving room for at least two peripheral cards, is necessarily massive. The Dimension system unit is handsome, but sports a footprint that would dwarf many a desk. Available as internal options in this large case are 96 track, double density floppy drives, and either a 20Mb or a 50Mb hard disk unit. The system we received for evaluation was supplied with three co-processor boards (8086, Z80, and 6512), as well as a memory card that brought the system up to 512K. A big footprint, yes—and a big wallop, too. The Dimension is a Texas behemoth.

The keyboard is OEMed from Key Tronic and offers the same improved PC layout as the Key Tronic 5150 replacement for the IBM PC. This is an 83-key full-stroke keyboard with 10 function keys nestled on the left, a 10-key numeric keypad nestled on the right, and a modified Selectric-style keyboard in center stage. The keyboard is not as sturdy as the standard IBM keyboard, nor does it offer the same crisp tactile feedback, but it is completely serviceable, and includes LED caps lock readout, which the PC keyboard does not.

We got the Dimension up and running without any major problems, and

Dimension 68000: Big footprint; big wallop, too.

Hardware Profile

Name: Dimension 68000
Type: Desktop microcamputer
CPU: Motoraloa 68000
RAM: 256K expandable to 512K
Operating System: emulates MS-DOS, Apple DOS 3.3 and Pro-DOS, CP/M, Unix (using caprocessors)
Ports: Serial, parallel, jaystick, NTSC videa autput, six peripheral slats
Display Resolution: Up ta 100 x 50 in text mode, 320 x 525 graphics mode
Keyboard: Detached 83-key fullstrake
Documentation: Good. System, UniBasic, CP/M 68K and C user manuals
Summary: Less than thrilling as an emulatian machine, but an extremely powerful 68000 machine for the pragrammer ar engineer
Price: $3900, with dual drives, main 68000 CPU, 256K; $5500 with 512K and three caprocessar cards
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hooked it to a composite monitor using the standard RCA phono jack. (An RGB card is available as an option.) The display can be configured to 20 x 20, 40 x 24, 80 x 25, 80 x 50, and 100 x 50 rows and columns, respectively. Needless to say, the 100 column by 50 row display is not advisable on an NTSC monitor.

Does it Do Jimmy Stewart?

Before you can get the Dimension into emulation mode, you must patiently move some files around. This is a little tiring, but the process is documented clearly enough. Finally you end up with a system disk—the first disk to boot on the Dimension when out of native mode. This system disk contains the emulation software to tell the hardware which impersonation you wish it to do. So far so good—we told the Dimension to become an Apple, and there before us appeared a 40 x 24 all-uppercase display with no screen editor and the familiar > prompt. Very convincing!

But a funny thing happened to our video output on the way to becoming an Apple—the top half of it began to tear. By playing with the vertical hold, we got the image to stick, but it remained jittery, with an unsightly bend to the left. A call to Micro Craft got us a very nice, helpful response, unfortunately to the effect of "play with the vertical hold." This was slightly unsettling. We were assured, however, that this fault has been corrected in subsequent models.

Compatibility and Inability

Then we started trying to load software. As has been my experience since the advent of work-alikes, compatibles, and emulators, some stuff works; some stuff sort of works; and some stuff just doesn't work. That's the way it is.

Such was also the case with IBM emulation. *Lotus* booted up, as did *WordStar*, and even *Flight Simulator*. A little further experimentation revealed that although *Flight Simulator* would boot, it didn't quite run correctly. We could not avoid backing up into Lake Michigan, no matter how hard we tried. Beyond that, not much else would even boot, and that which did ran only up to a point. We have determined time after time that copy protection is the worst foe of compatibles, and I believe it to be the culprit in this case as well. As protection schemes almost always reflect directly the very peculiarities of a given piece of hardware, they are by their nature the toughest conditions to emulate. That's the way it is.

On the CP/M front, things only got worse. I'll admit we don't have too much CP/M software lying around the lab anymore, but none that we did have would boot on the Dimension.

I was disheartened. The Dimension represents a valiant attempt to encompass the best of all possible software worlds, but does not really deliver on this promise. I placed a call to Don Bynum, head of the Dimension project for Micro Craft. I told him of my reservations and reminded him that for the price of a

Keyboard is equivalent to KeyTronic 5150.

Rear of unit sports serial, parallel, and mouse/joystick ports.

fully-blown Dimension, one could very nearly buy a full-blown IBM PC, with a full-blown Apple II, and a full-blown Kaypro CP/M machine. Sure, they would take up a lot of room, but at least you would know all your software would run. Why, then, opt for the Dimension?

Well somewhat to my surprise, Don had some very plausible answers to that question. I soon realized that I might be going about my hardware evaluation from entirely the wrong perspective. Can the Candide angle. Go for Casey Jones.

Desktop Diesel

Don described the Dimension as a computing locomotive. He suggested that the unit should not be reviewed as an emulation machine at all, but as a high performance 68000 machine, that at the same time offers a link back to some older software bases. He put forth the case of an engineer, involved in modeling and simulation, who already uses an IBM PC or Apple II to aid him in his work—but all he can do currently with a micro is the "administrative" part of his job. He can write his weekly reports on it. He can do his project budgets on it, and he can sum up his data in some primitive ways with it. But he cannot do actual modeling with it, because it is not powerful enough. There simply isn't enough RAM, or more significantly enough CPU power, to take care of the actual job he has at hand.

Using the Dimension, that engineer can do the things he would otherwise need to timeshare on the VAX or other comparable mini or mainframe to accomplish. As an example, he can do a 1000-point Fast Fourier transform in double precision in something under 20 seconds, including a hi-res output of the waveform. So the muscle is undeniably there, and solely in the hands of the person at the desk. At the same time, our hypothetical engineer can also drop his IBM emulator card into the Dimension, and continue to use the *Lotus* or *WordStar* software that he has been using all along.

Data by Rail

Bynum emphasized that emulation on the Dimension is not an end in itself, but a bridge between existing datafiles and the world of the 68000. Using the Dimension in emulation mode, existing datafiles can be ported over from existing environments to the environment of the 68000 processor, without raising the prospect of rekeying. To a CPA, or a small businessman with dozens of existing data disks, the Dimension offers a reasonable means to enter the CP/M 68K or other heavy-duty 68000-based sphere, without scrapping the work that has led to the existing, large database. This is a critically important consideration to those who have reached the limit of their current systems, but abhor the prospect of a changeover because it would mean massive and costly amounts of busywork.

Around the Bend, Unix

Further, the Dimension offers Unix potential for the future. As it rather spooks me, I offered that Unix might be an anchor around the neck, though a dif-

ferent kind of anchor than CP/M had proven to be. Don agreed that CP/M had "set the industry back five years," but responded that rather than another anchor around the neck, he viewed the coming of Unix as a potential "time bomb in the pocket." He continued:

"I'm a Unix enthusiast, and I went to a Unix user's group meeting in Dallas recently. I would typify the people who went to that meeting as falling into two classes: there were a bunch of guys with beards and sandals, who looked as if they might be offended at the statement that Unix could be used for useful work. They have been experimenting with operating system theory in Unix for ten years now. All of a sudden, though, that group is shrinking. AT&T has budgeted $150 million dollars to convince the business world that they will need Unix. That is creating a group that expects real results. And that group is growing. I think Unix is the best alternative that is out there right now.

"It does have some heavy burdens that come with it, though. It is like the operating system on a big computer—it uses loads of overhead. Like a big computer operating system, there are lots of things that can make doing a big job easier, too. But like a big computer operating system, if you take any kind of a power hit in the middle of the day, the consequences can be pretty grim. It is not as bad as it used to be, however. A benchmark of this was the track record of Dimension Unix during fall Comdex. We demonstrated our Unix system there—we ran it all five days—and suffeed three power failures in our building during those five days. We lost exactly one file. I was astonished. The only guy who was more surprised than I was our Unix engineer. He was first surprised, second happy, and third wondering when and where the other shoe would fall.

"The key is that Unix offers an incredibly powerful development tool, and while the shell itself is far from user-friendly, user-friendly shells can be developed on top of it. That is what is beginning to happen. The Dimension is sitting above the PC AT and AT&T entries in terms of performance, because we're using the 68000 as opposed to the 80286, and we run Unix with two 68000s—one 10 Meg component that's actually running Unix and one that's acting as file server and handling the I/O stuff. This dual-processor arrangement squeezes the most out of the system."

With CP/M 68K, the Dimension is also well-placed in the single-user market. People who need a tremendous amount of computing power will have a tough time finding a bigger engine in a desktop micro. Bynum pointed out that there are four Dimensions being used at the Jet Propulsion Laboratory for heavy number crunching. As a result, JPL saved the cost of another minicomputer system.

Changing Pitch

Though he admitted that the Dimension was originally pitched as "the machine for all software," the emphasis that Don now underscores is the Dimension as a superlative 68000 machine, with the plus that in emulation mode, lots of other stuff can run. "There is an attraction, I suppose," he said, "to the fact that with a straight face you can say that the Dimension is a machine that will run most of the software across the range from the Apple II to Unix. That's a pretty grand statement. But I don't know anyone who really wants to run most of the software across the range from the Apple II to Unix. Maybe a magazine editor like you, or someone like (industry and software analyst) Portia Isaacson. I hope Portia doesn't get mad at me, because we're old friends. But I can't name anyone else who is in a position to really want to do that kind of thing. And that's not where we're at."

I have to admit, Don had me there. For my less than typical needs, I would have welcomed the Dimension as the "universal" software machine. At the same time, I realize that there aren't a heck of a lot of other people in my position. I can't speak for Portia, of course (no one can do that). And from the point of view of an engineer, the Dimension is without question a powerful contender. Its benchmarks are unbeatable. Native mode Fortran and Pascal on the Dimension run rings around the IBM PC AT.

For sheer power, the Dimension is a winner. Space limitations preclude the inclusion of a comprehensive list of Dimension-compatible software packages, but you can download a list from the Creative Computing SIG or request one from the manufacturer. ■

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When integration isn't enough

Concurrent PC DOS

Chris Terry

Integration of several functions in one software package is a concept that has more than come into its own during the past year. Many popular "integrated packages" allow you to insert figures from their spreadsheet and database members into reports and letters prepared on their word processing members. But what if you need a more powerful word processor than an integrated package offers, or what if you want to include figures from an engineering program in your spreadsheet?

In those cases and many others like them, you must change concepts. You abandon "integration" and adopt "concurrency" or "multitasking." You look for a system that will let you run the programs of your choice "concurrently"—which is exactly what Concurrent PC DOS from Digital Research is designed to do.

Concurrent PC DOS is a multiuser, multitasking system that allows you to run up to four PC DOS or CP/M programs simultaneously. It can be used by one or two users, one who uses an IBM PC keyboard and display and a second who uses a dumb terminal connected via the serial port.

Hardware Requirements

The minimum hardware requirements are 256K of memory and two floppy disk drives. This configuration is sufficient to get the system up and running, and perhaps to run a single application program that is not too memory-hungry. However, it is quite inadequate to take advantage of the windowing capabilities or to use the multitasking feature.

DRI recommends at least 512K of memory, one or two floppy disk drives, and a hard disk; a hard disk configuration needs at least 1.2Mb of space, partitioned for CP/M.

The operating system occupies 150K, and each application program (window) starts at 64K; this brings the count to 406K when running four programs simultaneously. However, some care must be taken in allocating memory, since some programs (such as word processors and spreadsheets) claim all available memory for use as data buffers.

Installation

Installation of Concurrent PC DOS on a system with two floppy disks, or on an XT, is straightforward, and the instructions in the manual are clear.

If you have an XT, it is recommended that you back up all files on the hard disk, since you may have to reformat it with both a PC DOS and a CP/M partition. If your hard disk is an add-on (such as Tecmar or Tallgrass) you may encounter even more complications, since the hard disk installation program will not run unless the appropriate disk drivers are available to it. If you are not thoroughly familiar with the technical details of your system, you will need expert help for this type of installation.

Windows

You can simultaneously run programs in each of the four possible windows, although there are a few restrictions. You cannot, for example, run more than one program that uses BasicA. And, although you can reduce window size to display two, or even three, windows simultaneously, the usefulness of this feature depends upon whether the application programs will support it. Many applications, not designed for multitasking, bypass the operating system during screen updates and may try to write over the full screen, spilling into other windows. The DRI applications, however, are designed for multitasking and do not create this problem.

Software Profile

Name: Concurrent PC DOS
Type: Operating system
System: IBM PC/XT **Format:** Disk
Summary: Easy to use multitasking system with excellent menus
Price: $295
Manufacturer: Digital Research, Inc.
160 Central Ave.
Pacific Grove, CA 93950
(408) 649-3896

Utilities

Several system utilities are provided with Concurrent. FDMAINT and HDMAINT are formatters for use with floppy and hard disks, respectively; HDMAINT also allows the establishment of both a CP/M and a PC DOS partition on the hard disk. Another utility preempts part of main memory for use as a RAM disk, although the usefulness of this depends on how many windows you normally use at one time. It will speed things up if no more than two programs are to run simultaneously, but even 640K would hardly be enough for four programs and the RAM disk.

A really useful utility allows you to define up to 50 function keys for each window; it is somewhat like the CP/M-80 utilities *SmartKey* and *MagicKey* in that a single keystroke can represent an entire string.

The PRINTMGR print manager utility allows you to define a printer for each window, and provides print queuing of up to 255 files. It can be activated interactively from a menu or by command-line entries. One valuable feature is that for each window you can specify the number of copies to be printed, the printer to be used, and standard formatting parameters.

Three application programs are provided with the system: an editor, a communications package, and a simple database.

Editor

DR EDIX is a full-screen editor that supersedes the infamous ED and PC DOS EDLIN (which is nearly as bad as ED). DR EDIX creates straight ASCII

files with a carriage return/line feed at the end of each; lines may be up to 255 characters long and are numbered by DR EDIX internally, the current line number being displayed at the bottom right of the screen. DR EDIX allows you to work with four different files at once, each in its own buffer; a marked block of text can be moved within the same buffer or to one of the other buffers, to allow calling up boilerplate material.

The cursor can be moved left or right by character, word, or line, and up or down a line at a time. A scroll command moves the cursor up or down one page. Insert and overtype modes are both provided, and global find/replace commands are also available.

DR EDIX is not in any sense a word processor, but is a clean, simple editor for writing source code or simple letters and memos.

Communications

DR TALK is a versatile communications package containing all the features generally needed in communicating with other computers or bulletin boards and time-sharing services. It can upload and download both ASCII and binary files, using either its own protocol or the XMODEM (Christensen) protocol. For use with mainframes and commercial services, the pacing feature is extremely valuable. This feature sends ASCII files a line at a time, waiting either for a fixed time or until a prompt is received from the remote station.

A dialing directory can hold up to 60 names and phone numbers; each entry specifies the parameters to be used when communicating with the station.

Database

I did not have an opportunity to exercise CARDFILE, but it is a simple name/address/phone/comment database similar to a card file. Searching for a name is linear, either displaying all cards in sequence, or going directly to the required name.

Conclusion

Concurrent PC DOS is easy to use, considering its power, and is flexible in that it can run both CP/M-86 programs and PC DOS programs. The menus are excellent, because they give you enough information to do exactly what you want, yet don't hold up the expert user and infuriate him by making him go through several levels of menu. Besides, the real expert can always escape from the menu system altogether and work entirely at the system level with its cryptic prompts and complex command lines. But for the novice, or the person who only rarely uses some of the features, the menu system has one enormous advantage: at any time you can call up on-line help files to clarify details of the current operations available.

In performance, Concurrent is as fast as PC DOS and on a hard disk system is not noticeably slowed by running more than one program. The only trouble is that many applications are just not designed for multitasking systems and may not work well together. I have no doubt, however, that with the advent of more multiuser, multitasking systems such as IBM AT, many of the bestselling application programs will be updated to remedy the incompatibilities. ■

CIRCLE **408** ON READER SERVICE CARD

MAC/APPLE /IBM

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SAT	300.00	240.00
HBJ		
Computer SAT	79.95	64.95
Howard Soft		
Tax Preparer 1985	250.00	199.95
Mecca		
Managing Your Money	200.00	160.00
Broderbund		
Karateka	34.95	27.95
Print Shop	49.95	39.95
Graphics Library	24.95	19.95
Monogram		
Dollars & Sense IIe	100.00	79.95
Dollars & Sense IIc	125.00	100.00
Forecast IIc	59.95	47.95

IBM

	Retail	Your Price
Mecca		
Managing Your Money	199.95	159.95
Infocom		
Hitch Hikers Guide to Galaxy	39.95	31.95
Human Edge		
Mind Prober	49.95	39.95
Simon & Schuster		
Typing Tutor III	49.95	39.95
BEI		
Spanish	39.95	31.95
French	39.95	31.95
Broderbund		
Ancient Art of War	49.95	39.95
CBS		
Mastering the SAT	150.00	120.00
Krell		
SAT	300.00	240.00
Howard Soft		
Tax Preparer 1985	295.00	236.00

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MacForth Level II	249.95	199.95
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Mac Vegas	59.95	47.95
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Mac Spell Right	89.00	72.00
Mac Memory Disk	29.95	23.95
Turbo Touch	129.95	103.95
Soft-Tech		
MacAdvantage UCSD Pascal	299.95	239.95
Consulair		
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Central Point		
Copy II Mac	39.95	31.95
State of the Art		
Electric Checkbook	79.95	64.95
Monogram		
Dollars & Sense	150.00	120.00
Forecast	69.95	55.95

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CIRCLE 112 ON READER SERVICE CARD

Easy to use, the Personal Planner requires only a fifteen page documentation. A complete set of input sheets is also included. Available for the IBM PC, Sharp PC 5000 and other IBM compatibles. Also available on Apple II, the DEC Rainbow and other CP/M compatibles.

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Thermal dot-matrix print at a bargain price

Hush 80

Owen Linzmayer

Manufactured in the United States by Ergo Systems, the Hush 80 is said to be the lowest priced 80-column dot-matrix thermal printer currently on the market. Carrying a suggested list price of $139.99, the Hush 80 portable printer features 80-column bi-directional printing at roughly 80 characters per second, graphics at 4800 dots per square inch, and weight of only 25 ounces. The Hush 80 is offered in three models, each of which comes with a 100' roll of thermal paper loaded and ready for use, and a 9-volt AC wall transformer with power cable.

Priced at $139.99, the Hush 80 CD comes complete with interface and cable for plug-compatibility with the Commodore line of computers. The Centronics-type parallel interface version, Hush 80 P, and serial RS-232 interface version, Hush 80 S, are both priced at $159.99 with the appropriate cables. Though all of the models are essentially alike, this review was based upon my experience with the Hush 80 CD.

The Hush 80 CD is an attractive little printer, and when we put the measuring tape to its cream colored body we find its dimensions to be 11.6" x 5.5" x 2.8". Given its small size and light weight (36 ounces with a 100', 8.5" wide roll of thermal paper loaded), the Hush 80 CD is perfect for portable printouts; it was designed to fit in a conventional briefcase. Though it normally requires a 9-v DC transformer, the Hush 80 CD is available in a rechargeable battery-operated version for true portability.

Following the directions in the 37-page user's manual, set up of the Hush 80 CD is no more difficult than connecting the 6-pin DIN interface cable to the serial port on the Commodore and plugging the transformer into a wall outlet. The printer is turned on with the switch located on the left side of the unit above the power cord. Once activated, the linefeed button should light up, indicating that the printer is ready to receive data from the computer.

Incidentally, the linefeed button is the only mechanical control device on the printer. If you depress the linefeed button when you turn the printer on, you activate the self-test which results in a brief demo, along with a sample printout showing all of the features of the Hush 80 CD. In other cases, the linefeed button advances the thermal paper one line.

The manual contains Basic programming information needed to take full advantage of all features. As you can see in the sample output, the Hush 80 CD is capable of printing upper- and lowercase alphanumerics, as well as the complete Commodore graphics character set. In addition, you can design and print your own custom character set by entering the graphic mode. Using a printhead with a 5 x 7 matrix, the Hush 80 CD prints 40, 80, or 160 characters per line bi-directionally at an average rate of 80 characters per second. Graphics are printed uni-directionally on a 6 x 7 matrix. And as its name would have you believe, the Hush 80 CD operates very quietly (56dB).

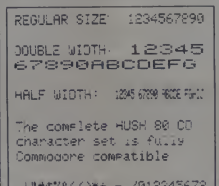
There you have the specifications of the printer, but let's talk reality. The print quality is nice for a dot-matrix thermal printer, but you get what you pay for, and for $140 you shouldn't expect near-letter-quality output. What you do get is a very consistent, legible dot-matrix character set, though I was disappointed to find that the lowercase characters lack true descenders.

For a budding programmer on a budget, the Hush 80 CD is perfect since it has the ability to print all of the Commodore special graphics characters. Likewise, the battery-operated serial and parallel versions of the Hush printer are excellent for portable computer enthusiasts who desire draft quality 80-column output or can't afford the HP Thinkjet. However, if you are shopping for a printer for correspondence or other serious word processing applications, you will probably have to spend a bit more for a plain-paper impact dot-matrix printer. ■

CIRCLE 411 ON READER SERVICE CARD

Hardware Profile

Name: Hush 80 **Type:** Thermol dot-matrix
Feed: Friction **Speed:** 80 cps
Interface: Commodore, parallel, or seriol
Density: 5 x 7 text
Graphics: 4800 dots per square inch
Character Sets: 2 **Buffer:** n/a
Logic Seek: Bidirectional
Summery: If money is an object, this may be the solution
Price: $139.99
Manufacturer: Ergo Systems, Inc.
26254 Eden Landing Rd.
Hoyword, CA 94545-3718
(415)786-3746



Hush 80 sample output.

Photography by Jeff MacWrath.

A happy marriage of form and function

C. Itoh 7500EP

Owen Linzmayer

In the world of printers, the marriage of form and function is not always a happy one. Often one trait is compromised for another; leaving you with either a beautifully inoperative machine or an unsightly beast of burden. Such is not the case with the 7500EP dot matrix printer from C. Itoh. Recently reduced in price to a competitive $289, the 7500EP is one dot matrix printer that combines sleek good looks with uncompromised features.

Casting a critical eye upon the C. Itoh 7500EP, we see that it measures 14.9" wide, 4.4" high, and a foot deep. The 13.1 pound unit has a body that gently slopes down to a front control panel upon which several lights and switches are located. There are three lights that signal the status of the power, paper, and printer (on-line or de-selected). Also found on this front panel are the linefeed (LF) and top of form (TOF) switches. Above this panel is the hinged cover of the printer that opens to reveal the printhead and paper loading mechanisms.

The 7500EP uses a precision 9-wire print head and a large multi-strike ribbon cartridge to produce text characters on a 9 x 11 matrix. Graphics are also available at up to 240 dots per inch. The position of the printhead itself can be adjusted in relation to the platen so that the 7500EP can accept forms up to three parts thick. Both friction and sprocket feed mechanisms come standard on the 7500EP, though my experience is that loading a single sheet of paper is a troublesome task. However, unlike many other low-cost printers, the 7500EP does not suffer the common problems of tearing fan fold paper and "eating" its own output.

The back of the 7500EP sports the power cable, two banks of DIP switches, and the parallel interface connector. (Note: the 7500AR is the RS-232C serial equivalent of the 7500EP, and at $329, costs a bit more. I know not why). Options available via DIP switch settings include carriage return followed by linefeed, form length (11" or 12"), line spacing, perforation skip, uni- or bidirectional printing, and line buffer size. As shipped from the factory, the 7500EP comes equipped with a 2K print buffer, and can be expanded.

Hardware Profile

Name: 7500EP **Type:** Impact dot-matrix
Feed: Sprocket and friction
Speed: 105 cps **Interface:** 8-bit parallel
Density: 9 x 11 normal text
Graphics: 240 dots per inch
Character Sets: 2 **Buffer:** 2K
Logic Seek: Bidirectional
Summary: Attractive features and price **Price:** $289
Manufacturer: C. Itoh Electronics, Inc.
5301 Beethaven St.
Las Angeles, CA 90066
(800) 423-0300
(617) 769-8770

```
This is the C. Itoh
Normal Mode
Emphasized Mode
Double Strike Mode
Compressed Mode
Double-Wid
example of superscrip
example of subscript
Standard underlining
```

Sample printout from the 7500EP.

The folks at C. Itoh claim that the 7500EP is fully compatible with the Epson RX-80 dot matrix printer, with the exception that the 7500EP is slightly faster (105 cps in normal mode) and somewhat cheaper. The 7500EP sports six different character pitches: normal, double width, compressed, double width-compressed, sub- and superscript. It also has double strike and emphasized modes (see sample printout).

In addition to enjoying the variety of text modes, I've had little difficulty obtaining beautiful screen dumps using graphics programs configured to think the printer is an RX-80. For the most part I have found the Epson compatibility claim to be substantiated.

The printer self-test is accomplished by turning the power on while holding down the top of form (TOF) button. The 7500EP reacts by printing its entire character set over and over, until the printer is shut off. When the power is turned on while the linefeed (LF) switch is depressed, all data received from the host computer is printed out in hexadecimal form. This function facilitates troubleshooting of hardware and software problems. Two other self-explanatory amenities are the emergency print halt and the paper empty over-ride.

Though the 40-page user's manual that comes with the 7500EP could use a little revision to make it more comprehensible to the neophyte, it does an adequate job. The many illustrations and charts help you get the most out of this inexpensive dot matrix printer. The printer itself is a well-designed unit with a nice array of features and very attractive lines. Not only is the 7500EP easy on the eyes, its low price makes it easy on the budget. ■

CIRCLE 412 ON READER SERVICE CARD

Photograph by Jeff MacWright

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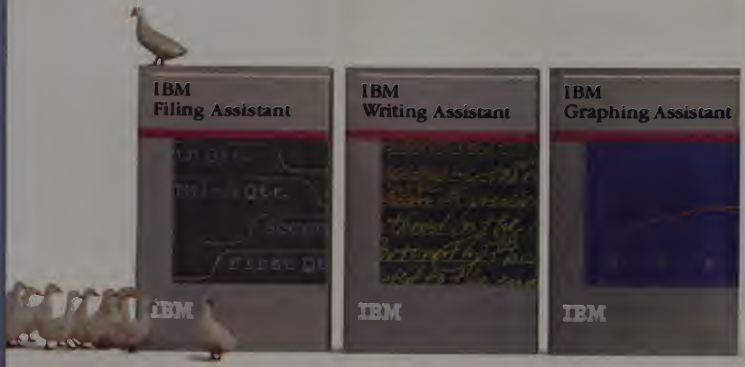

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ducks in a row.

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CIRCLE 127 ON READER SERVICE CARD

Little Tramp character licensed by Bubbles Inc., s.a

1985 Winter Consumer Electronics Show

David H. Ahl

What was new at Winter CES? Everything under the sun from computers to robots to vaporware. We'll be reviewing many of the best products in coming months; meanwhile, here is a small smattering of hardware, software, news, views, and parties.

Commodore introduced the C128 computer with 128K of RAM, 80-column display, and CP/M-80 compatibility. Their double-page ads screamed "Bad news for IBM and Apple." We don't think so. Although the C128 is fully compatible with the C64 (means big software base), CP/M-80 is out of date, and you need a monitor to use the 80-column capability. We hear that Commodore wanted to price the machine at $399, took a look at the new Atari entries, and went back into a huddle. Best bet is a retail price around $250.

On the other hand, the LCD portable from Commodore looks like a potential winner. It has a 16-line by 80-character display, 32K RAM, 96K ROM, built-in modem, 72 keys, and built-in software including word processing, spreadsheet, file manager, Basic, and several other programs. Price: "well under $1000."

The most effective product demonstrators at CES? No contest. The kids, ages 8 to 14, who were demonstrating the line of games from **Epyx**. President Mike Katz, one of the best promoters in the business, happily stood back and let these youngsters steal the show. Ten new entries from Epyx include two dynamite games from **Lucasfilms**; a sci fi game (*Moreta: Dragonlady of Pern*); and high-tech versions of *Barbie, Hot Wheels*, and *G.I. Joe*. These last three games provide non-structured creative play for children four to ten years old.

Woeful is the troll who doesn't act quickly in *Trolls and Tribulations*, a new strategy/action game from **Creative Software**. In the game, the player must lead trolls through treacherous underground caverns to recover treasures.

In *Break Street*, players guide game characters through such breakdancing movements as the tut, scorpion, windmill, and moonwalk. The DeRoxy Crew, a Seattle breakdancing group, consulted on the development of the game.

The first third-party Apple software company, **Muse**, was started by Ed Zaron eight years ago. Many ups and downs later, Ed is still going strong and has released his latest package (a C64 program!) *Smart Start*. Ed was impressed with the power of the C64 but felt that users needed a better way to get at its capabilities. *Smart Start* was the result, and it meets its objectives admirably.

Other Muse favorites include *Castle Wolfenstein, Beyond C.W., Three Mile Island* (unbelievably realistic simulation), *Robotwar, Super Text*, and many others.

Wico introduced the SmartBoard, an intelligent keyboard/trackball peripheral for IBM PC and Apple II computers. Each of ten function keys can be programmed to contain as much as 126 characters of data, while the trackball can be used for cursor movement or mouse emulation.

Telelearning, a San Francisco based telecommunications firm, has announced several new college courses available to Apple, IBM, and C64 owners. Telelearning is a two-year old company that allows personal computer users to earn college credits at home by providing course material on disk and access to a college instructor by modem. To get final course credit, a student must take a proctored exam at a test center and apply for credit at one of the 2000 participating universities. Courses cost $35 to $200.

At the **Prentice-Hall** booth, *Skiwriter II* was being demonstrated by author Ken Skier, a former creative writing teacher at MIT who helped develop the highly-regarded Wang word processor. *SkiWriter II*, a friendly fast package has built-in telecommunications so that information can be downloaded from an on-line database and entered directly into wp documents. For the C64, PC, PCjr, and Apple; $69.95.

Most intriguing CES party: The **Infocom** participatory murder mystery staged by the New York based Murder-To-Go troupe. Guests were witness to various incriminating scenes and could examine the place where the body was found as well as police reports. Nine people solved the mystery, and the top winner won a trip to Bermuda.

Going for the big names is the strategy of **Simon & Schuster's** Electronic Publishing Group. Initial entries include computerized versions (for the IBM PC) of *J.K. Lasser's Your Income Tax* and *Your Money Manager*. *Webster's New World Spelling Checker*, *The Great*

Mac Art Dept.

International Paper Airplane Construction Kit (for the Mac), and a non-celebrity clip art program for the Mac, *The Mac Art Dept.*

Flyers' favorites: the new **subLogic** *Flight Simulator II* and **MicroProse** *F-15 Strike Eagle* games. The F-15 is fabulous with its radar and infra-red guided missiles, bombs, cannons, ECM, flares, and full aeorbatic capabilities. Cut in the afterburners and watch this baby move out! We hear that some fanatics have hooked two computers together and staged interactive dogfights. We didn't see any, but we did see a similar setup with the Nexa MSX flight simulator program. Very intense!

Electronic Arts displayed several new items including a Mac version of its *Financial Cookbook*, a *Racing Destruction Set* which allows players to design their own tracks and race cars, the *Adventure Construction Set*, and *Mail Order Monster* (a robot kit in which creatures can be designed and pitted against each other in three levels of combat).

PlayNet, a new company, offers a network for C64 owners. The net can be used for electronic mail, CB, transferring programs, and, most important, playing scores of on-line games. Current games include backgammon, checkers, chess, bridge, go, and eight more. The initial fee is $40, and there is a $6 monthly service charge.

Gamestar showed a line of highly realistic sports simulations including football, baseball, tennis, and a new one, auto racing. Unlike other racing games, *On-Track* provides head-to-head competition on any of ten famous raceways. Although you view the course from overhead, you still get non-stop racing action from start to finish.

*Q*Bert* is back in a sequel, *Q*Bert's Qubes*. In this game from **Parker Bros**, Q*Bert must hop from qube to qube and rotate them with his feet, while dodging Meltniks, Soobops, and the infamous Rat-A-Tat-Tat. 'Tain't easy!

Another sequel—to *Montezuma's Revenge*—is *Barbados Booty*, an undersea diving adventure. All 128 chambers in a maze of coral and sunken ships are infested with dangerous denizens of the deep—although there are many gems and valuable treasures scattered about as well.

Activision, once king of the Atari 2600 VCS game world but now a much slimmed-down company, was not showing a single 2600 game. An open letter from president Jim Levy says "We believe that 1985 is the beginning of a new era for home computers and home computer software . . . " (Well, whadaya know!) On the bright side, Activision was showing some of the most playable computer games on the show floor.

Stickybear, the hero and guide for the **Weekly Reader Software** learning programs came alive at the Winter CES. The funny, furry bear, created by the renowned illustrator, Richard Hefter, stamped his feet (danced?) to the music of the booth across the aisle and posed for photographs.

Niftiest product that will never reach the market: **Toki's** biometal robot. This miniature robot is controlled by a titanium-nickel alloy which "remembers" a shape or position. Heating the joints by a pulse current extends them, but when they cool, they return to their original shape and position. Toki was also showing an innovative light-driven interface that can control the robot or other motors and household appliances. We're rooting for you Toki, but . . . .

According to Cathy Carlston of **Broderbund**, sales of *The Print Shop* exceeded the wildest expectations of the company. And now, *The Graphics Library*, the add-on package of enhancements and fonts, seems to be pushing *The Print Shop* to new sales highs. We're happy to hear it—we loved *The Print Shop* when we reviewed it, and there are no nicer people in the industry than the Carlstons.

Third party software is quietly making the scene for the **Sharp** PC-5000. Sorcim released portable versions of *SuperWriter*, *SuperCalc2* (not 3), *SuperPlanner* and *SuperComm*; from I.U.S. come *EasyWriter II*, *EasyPlanner*, and *EasyComm*; MicroPro released *WordStar*; and Software Publishing released *PFS:File* and *PFS:Report*. In addition, one of the biggies in the Model 100 business, Traveling Software released their five major applications packs for the PC-5000.

MSX continues to be an enigma. **Microsoft** showed one each of all the currently available MSX machines from Japan and Korea, but no one was taking

orders. The official line was "wait until Summer CES." The machines creating the most excitement were those with interactive video capabilities (Pioneer, Sony, and JVC).

Heard from the top ad rep of a leading computer magazine at CES: "Five of the biggest companies here are living in glass houses. When the after-Christmas returns start coming back, they'll be down the tubes—or looking for a bailout." ■

Tom Adams

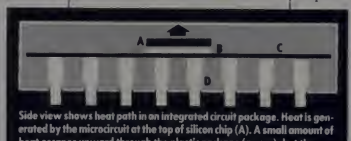
Using ultrasound to detect defects

Inside An IC

Once, long ago, you had your first glimpse of the inside of a computer. Someone lifted the monitor, removed the cover, and pointed to shiny black plastic rectangles with short silvery legs sitting on a green board. "That's the memory," you were told. And you took it on faith.

The thing about integrated circuits is that, unless you design and manufacture the things, you do pretty much have to take them on faith. Either they work or they don't. You can't repair an IC.

When an IC does fail, "overheating" is likely to be cited as the cause. ICs generate heat, and that heat must be dissipated. That is why your computer has vents and maybe even a fan. But even with an active cooling system like a fan, some ICs self-destruct. This is what manufacturers call "premature failure in service," and it has a great deal to do with the way ICs are made.



Side view shows heat path in an integrated circuit package. Heat is generated by the microcircuit at the top of silicon chip (A). A small amount of heat escapes upward through the plastic package (arrow), but the plastic is too good an insulator to allow much to escape. The best path by which heat can escape is downward through the bond layer (B) to the lead frame (C). Cracks, voids, and separations in the bond layer can block this route, causing overheating. Heat continues along prongs of lead frame, eventually traveling down the pins (D) into circuit board. Small amounts of heat are dissipated into the plastic along the way.

Physical Characteristics

The active part of the IC package is the chip itself, that precocious sliver of silicon. Also embedded in the black plastic package is the lead frame, a flat metal cut-out. In the center of the frame is a square called the "flag" from which radiate leads.

During manufacture, the chip is attached to the flag of the lead frame. This sounds innocent enough, but just *how* the chip is attached has profound implications for the future of the chip.

After the chip is in place, very fine gold wires are installed to bridge the gap between the relatively huge legs of the lead frame (which are the connections of the chip to the outside world) and tiny bond pads on the chip itself.

Next, the outer ends of the legs are bent, and the whole thing is encased in an extrusion-molded package of black plastic. The purpose of the plastic is to protect the chip from the environment—especially from moisture. The finished product is known as an IC package, or more technically a 16- or 40-pin plastic DIP (dual in-line package).

When the completed IC package is installed in a computer and power begins to flow through it, the chip begins to generate heat. The ordinary operating temperature of a chip is somewhere between 100 and 165 degrees C, depending on its particular use.

It is important to keep that temperature under control. As a rule of thumb, the life of the chip is cut in half for every 10 degrees Centigrade the temperature rises above normal. So the question becomes: how can heat be allowed to escape from the IC package?

Assembly

Let's take a close look at the IC package and the way it is assembled. One of the most important steps is the attachment of the chip to the lead frame. Typically, on the production line, a row of lead frames moves along a track, stopping first for a dab of silver-filled epoxy to be placed on the flag at the center of the lead frame, and then for the chip to be dropped on by a pick-and-place arm.

A good part of the future of your computer is determined at the moment the arm places the chip on the lead frame. Why? We'll see shortly.

When the package IC is put into service, the chip heats up, as mentioned above. Unless heat is removed from the chip and the package around it, the chip will fall victim to a condition known as "thermal runaway," in which increasingly higher temperatures destroy the chip.

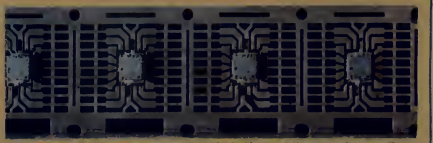
You might expect heat to escape upward from the chip. A small amount of heat does follow this route, even though the plastic in which the chip is encased is a mediocre conductor of heat. But the lead frame on which the chip rests is an excellent conductor. Even though there are many different kinds of plastic, of course, and different kinds of lead frames, too, the lead frame does offer the easiest route by which heat can escape.

But between the chip and the lead frame is the layer of epoxy that holds the chip in place. Sometimes solder is used instead of epoxy, but the problem is the same: both epoxy and solder are relatively poor conductors of heat. Heat from the chip will escape via the lead frame—but only if it can get *to* the lead frame.

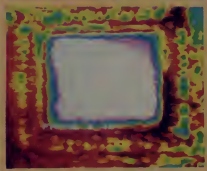
This is why the attachment of the chip to the lead frame is so important. The attachment material, whether it is solder or epoxy, needs to be as thin as possible (slightly more than a thousandth of an inch is typical) and as intact as possible. Several things can go wrong:

- The epoxy may crack as it shrinks and cures.
- Voids (actually bubbles) may form—especially in solder.
- The epoxy or solder may be separated (usually because of surface contamination) from the chip or the lead frame.

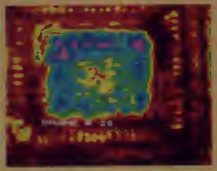
Any of these defects can keep heat from escaping from the chip. And once the chip is in place, defects are very difficult to detect and image with conventional detection technologies like x-ray. X-ray will spot a defect such as the complete absence of solder under part of a



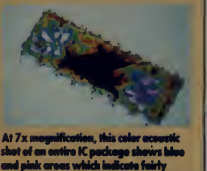
Left: Scanning Laser Acoustic Microscope provides inside views of integrated circuits. The IC goes on the stage near the technician's hand; note the red laser glow on the stage. Above: A close-up view of chips bonded to lead frames. Attaching the chip to the lead frame is a vital part of IC production.



A color acoustic photo of one chip attached to a lead frame. Magnification is about 70x. Flag and nearby regions of the lead frame appear green and orange, but the chip itself (including the bond layer beneath the chip) are white, indicating a good bond.



A color acoustic photo of a similar chip attached to a lead frame. This chip has definite bonding problems: the pink area is fairly well bonded; the green area, less so. The small red area at the center may not be bonded at all. Heat would not easily escape from this chip, and it would be likely to fail in service.



At 7x magnification, this color acoustic shot of an entire IC package shows blue and pink areas which indicate fairly good transmission; the structure of the lead frame is partly visible in these areas. But a large crack in the plastic package—the black-red area—covers the center of the IC, including the chip location. This package would probably permit lethal moisture to reach the chip.

chip, but doesn't usually reveal gaps.

Defect Detection

Detecting defects requires a new technology—specifically, acoustic micro-imaging. High frequency ultrasound is very sensitive to internal interfaces, and it is nondestructive. What happens is that the ultrasound is partly or entirely blocked by cracks, voids, separations, and the like.

The internal-feature photographs accompanying this article were made with the Scanning Laser Acoustic Microscope (SLAM, for short), made by Sonoscan, Inc. of Bensenville, IL. Properly termed acoustic amplitude micrographs, these photos show interior views of their subjects.

ICs (and many other objects) are opaque to light, but transparent to ultrasound. The SLAM transmits very high frequency upward through an IC, and a scanning laser "reads" the level of ultrasound that arrives at the top surface. A digital signal processor assigns a color to each level of ultrasound, and the full image is displayed on a color monitor.

All ICs, because they contain internal interfaces at the lead frame and chip, produce some sort of acoustic image. Ordinarily, the acoustic image of an IC with no unintended interfaces shows faint outlines of these features. The value of the SLAM is that it reveals *unintended* interfaces in an IC.

Virtually all IC manufacturers use electrical tests to weed out obviously bad ICs. Some also use a SLAM to image their ICs, either before or after they are encased in plastic. They look especially for anomalies in the bond layer. If a bond layer shows only a few tiny voids, it will probably pass, because the area of a void is what matters. Many tiny voids, a single large one, or a massive separation, will cause an IC to be rejected.

The SLAM also looks at the completed IC package. Here, bubbles in the molten plastic can form voids, and cracks can occur. Any defect in the plastic is potentially serious, because it can destroy the hermeticity of the package and allow moisture to reach the chip.

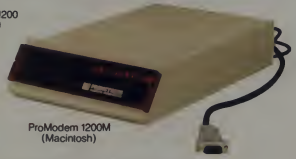
This isn't meant to be a horror story. Its purpose isn't to make you run to your computer and peek inside to see whether your ICs are sprouting delaminations, creeping with contaminants, or approaching thermal runaway. Most ICs work and keep on working. Manufacturers have developed lead frame and package designs which largely prevent overheating.

Computer stores expect most IC failures to occur during the first few weeks after the sale; these are the ICs with gross internal defects, and their replacement is generally covered by warranty. Most of the ones that survive the initial burn-in period will remain hale and hearty for the life of the machine. But if someday you do run across a dead IC, you will have a good idea of what caused its demise. ■

ProModem 1200... HOT-LINE

Our ProModem 1200 Makes Smart Modems Look Dumb

ProModem 1200
(RS-232)



ProModem 1200M
(Macintosh)

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No wonder Smart Modems, Cats, and Maxwells cringe when compared to our $495 ProModem 1200, an expandable 1200/300 baud modem for use with all personal computers. It costs less, but is smarter than the rest.

And when you add our $99 Communications Buffer and Alphanumeric Display options, ProModem 1200 becomes a veritable genius!

Imagine, you unplug your computer, take it home for the weekend, and while you're gone, ProModem 1200 answers the phone, collects messages up to 50 pages long, sends out electronic mail, and displays all events with the exact time of each. Thanks to ProModem 1200, expensive, hard-to-use communications software isn't needed. The communications is in the modem, and electronic mail becomes a background function, where it belongs.

Simple To Install And Use

Our Communications Buffer is a 4 by 6 card that plugs into the ProModem 1200 motherboard. It comes with 2K of CMOS battery backed-up memory, expandable to 64K. Part of the memory is used as a dialing directory with the balance reserved for storage. For $99 more, a front panel Alphanumeric Display can be added to show time, date, and 24 status and help messages. These two powerful options can be included at time of purchase, or can be added later.

Hayes Compatible

ProModem 1200 is Hayes compatible but that's where the resemblance ends. Our standard $495 modem includes a real-time clock/calendar. Hayes charges hundreds more for a Smart Modem with a time-base. Nor do they have electronic mail capability at any price.

ProModem 1200 contains a battery backed-up real-time clock/calendar, a large dialing directory and can send or receive messages up to 50 pages long without tying up the computer.

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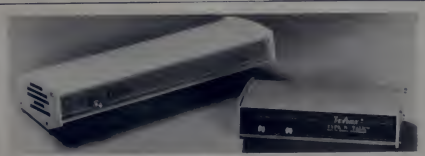
What's New In Hardware

Russ Lockwood



Speech Synthesizers

Votrax has introduced two speech synthesizers for a wide range of computers, including IBM PC and compatibles, Apple II, Atari 400 and 800, TRS-80 Model I, II, and Color Computer, Commodore 64 and Vic-20, and any other computer with an RS-232C serial interface.

The Personal Speech System, built around a Z80 microprocessor and a special SC-01 CMOS speech synthesis chip, has 256 programmable frequencies and 16 programmable amplitude levels which can be adjusted to achieve various inflections. Votrax claims it is 95% accurate in translating computer data into conversational English. It includes a three-voice, eight-octave musical tone generator, an internal speaker, and a real-time programmable clock. The unit retails for $395.

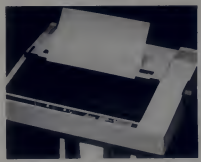
Type 'N' Talk, also built around the SC-01 CMOS speech synthesis chip, is a scaled down version of the Personal Speech System. Votrax claims it is 75% accurate in translating computer data into conversational English. It retails for $249.

Votrax
1394 Rankin
Troy, MI 48083
(313) 588-2050

CIRCLE **414** ON READER SERVICE CARD

Sakata Printer

Sakata, a manufacturer of monitors, has introduced the SP-1000, a 100 cps bidirectional dot matrix printer. It features 12 variations for

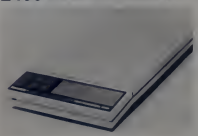


character printing, proportional character spacing, adjustable tractor and friction feed, and bit-mapped graphics printing at 5600 dots per second. The SP-1000 retails for $329.

Sakata
651 Bonnie Ln.
Elk Grove Village, IL 60007
(312) 593-3211

CIRCLE **415** ON READER SERVICE CARD

2400 Baud Modems



Novation has announced the Professional 2400 Communications System, a 2400 baud auto-dial, auto-answer modem for the IBM PC, Apple Macintosh, and AT&T 6300. It also provides 1200 baud and 300 baud communication, Hayes command language compatibility, and 327x/3770/3780 mainframe terminal emulation. The Mite communications software package is included. The modem sells for $795.

Novation
20409 Prairie St.
Chatsworth, CA 91311
(818) 996-5060
(800) 423-5419

CIRCLE **416** ON READER SERVICE CARD

Racal-Vadic has unveiled the 2400PC, an internal 2400 baud modem for the IBM PC, and the 2400V, an external 2400 baud modem for all computers with an RS-232C serial interface. Both auto-dial, auto-answer modems are also capable of 1200 baud and 300 baud communication and feature automatic switching between voice and data communication, pulse and tone dialing, and call-progress detection. The 2400PC and 2400V retail for $795 each.

Racal-Vadic
1525 McCarthy Blvd.
Milpitas, CA 95035
(408) 946-2227

CIRCLE **417** ON READER SERVICE CARD

Sumicom Printer and RGB Monitor

Sunicom has announced the 1120, an 18 cps bidirectional daisywheel printer. A Centronics-type interface is standard, with RS-232C serial and 12-bit Qume Sprint 3 parallel interfaces optional. The 1120 accepts paper up to 13" wide, provides proportional spacing, and carries a suggested retail price of $495.

Sumicom also has introduced the 2120 Color Monitor, a 12" RGB monitor with text resolution of 25 lines of 80 characters and graphics resolution of 600 x 200 pixels. The dot pitch is 0.38 mm. The 2120 retails for $499.

Sumicom
17862 East 17th St.
Tustin, CA 92680
(714) 730-6061
CIRCLE 418 ON READER SERVICE CARD

IBM PC AT Expansion Boards

Profit Systems has introduced two expansion boards for the IBM PC AT. AT Power is a multifunction expansion board that holds up to 4Mb RAM and includes both serial and parallel ports. A second serial or game port is optional. The base configuration of AT Power, with 128K RAM, retails for $495.

Multigraph, a monochrome or color graphics adapter board, has monochrome resolution of up to 720 x 700 pixels and color resolution of 640 x 200 pixels. The base price of Multigraph is $499.

Profit Systems
4655 Old Ironsides Dr.
Suite 400
Santa Clara, CA 95050
(408) 748-9551
CIRCLE 421 ON READER SERVICE CARD

Plotter Kit

Heath has released the IR-5208 Digital X-Y Plotter, a $349.95 kit version of the one-pen Sweet-P Plotter. A $19.95 software support package, which includes a parallel interface cable, a tutorial, and four color pens, is available.

Heath
Benton Harbor, MI 49022
(616) 982-3210
CIRCLE 422 ON READER SERVICE CARD

Hard Disk Drive for Macintosh

Corvus Systems has introduced the Omnidrive, a line of hard disk drives available in 5Mb, 11Mb, 16Mb, and 45Mb versions for the Apple Macintosh. Each drive comes with a 15' interface cable and appropriate system software.

Retail prices range from $1995 for the 5Mb model to $4995 for the 45Mb model.

Corvus Systems
2100 Corvus Dr.
San Jose, CA 95124
(408) 559-7000
CIRCLE 423 ON READER SERVICE CARD

Bernoulli Box for Macintosh

Iomega has introduced the Bernoulli Box, a 5Mb storage system, for the Macintosh. The Box stores data on removable cartridges and offers access time of 50 milliseconds. The Bernoulli Box retails for $1895, with cartridges selling for $59 each.

Iomega
4646 S. 1500 West
Ogden, UT 84403
(801) 399-2171
CIRCLE 419 ON READER SERVICE CARD

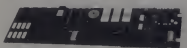
IBM PC Reset Button

Security Microsystems Consultants has introduced PC Reset, a kit that allows users to install a reset button on the IBM PC. A module replaces a ROM chip, and the reset button mounts in an already existing hole in the rear panel of the system unit. PC Reset retails for $89.95.

Security Microsystems Consultants
16 Flagg Pl. Suite 102
Staten Island, NY 10304
(212) 667-1019
CIRCLE 420 ON READER SERVICE CARD

Voice Input/Output Board

NEC America has released SAR-10 Voice-Plus, a voice recognition and audio response expansion board for the IBM PC. NEC uses a



custom chip with a 250-word capability to digitize spoken input. An ADPCM chip reproduces speech. The SAR-10 stores up to 65 seconds of audio response.

Utility programs allow users to integrate voice input and output into software. The SAR-10 carries a suggested retail price of $1495.

NEC America
8 Old Sod Farm Rd.
Melville, NY 11747
(516) 753-7000
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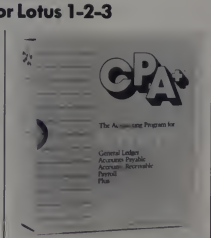
What's New In Software

Russ Lockwood

Accounting Program for Lotus 1-2-3

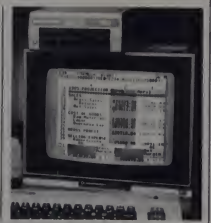
GNP has released *CPA+*, a fully integrated, menu-driven accounting program that operates with *Lotus 1-2-3*. It includes accounts receivable, accounts payable, general ledger, and payroll functions. Data are stored in memory for instant access. The $695 package runs on the IBM PC or compatible, requires 356K RAM, and includes a demonstration disk and tutorial.



GNP
1244 E. Colorado Blvd.
Pasadena, CA 91106
(818) 577-7767
CIRCLE **425** ON READER SERVICE CARD

C64 Spreadsheet

Cardco has introduced *Calc Now!/64*, a spreadsheet for the Commodore 64. It has a capacity of 64 rows by 254 columns, reserves 39K of memory for data, and provides on-screen help. It supports logical operations AND, OR and NOT; standard and special mathematical functions; and horizontal and vertical windowing. It includes an on-screen calculator and carries suggested retail price of $39.95.



Cardco
300 S. Topeka
Wichita, KS 67202
(316) 267-6525
CIRCLE **426** ON READER SERVICE CARD

Word Processor for HP Portable

Lexisoft has released the *Spellbinder* word processing and office management system for the Hewlett-Packard Portable computer. Functions include word processing, mail merge, spelling checker, forms and data handling, columnar manipulation, and calculator. Files created on the HP Portable can be read by *Spellbinder* on the HP 150. The package retails for $495.

Lexisoft
Box 1378
Davis, CA 95617
(916) 758-3630
CIRCLE **427** ON READER SERVICE CARD

Software Updates for PC AT, et al.

Ashton-Tate has updated its integrated software package *Framework* to support the IBM PC AT and AT&T 6300. The company has also improved the copy protection system to allow *Framework* to be installed on a hard disk without the need to place the "key" disk in the floppy drive. *Framework* retails for $695, and the update is available to registered owners for $25.

Ashton-Tate
10150 W. Jefferson Blvd.
Culver City, CA 90230
(213) 204-5570
CIRCLE **428** ON READER SERVICE CARD

Microrim has released IBM PC AT versions of its *R:base* relational database management systems and *Clout* natural language software. *R:base* retails for $495, and *Clout* retails for $249.

Microrim
3380 - 146th Pl. SE
Bellevue, WA 98007
(206) 641-6619
CIRCLE **429** ON READER SERVICE CARD

MultiMate Update

Multimate International has updated its *MultiMate* word processor to include proportional spacing, an improved merge utility to access standard ASCII files, document protection options, and support for 275 printers. *MultiMate* requires an IBM PC or compatible and 256K RAM.

Multimate International has also released a version of *MultiMate* for the HP 150 computer. Both versions retail for $495.

Multimate International
52 Oakland Ave., N.
East Hartford, CT 06108
(203) 522-2116
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Integrated Software

Electronic Arts, long known for its excellent games, has entered the business market with *Get Organized!*, an integrated software package for the IBM PC, PCjr, PC AT, and compatibles. It features a full function word processor, address book with mail merge, telecommunications manager, index card filing system, calendar, calculator, and notepad. It provides multiple windowing capability, comes with $200 in coupons for various telecommunications services, requires 256K RAM, and retails for $199.

Electronic Arts
2755 Campus Dr.
San Mateo, CA 94403
(415) 571-7171
CIRCLE 431 ON READER SERVICE CARD

Educational Software

MECC has introduced five educational programs for Apple II series computers.

Jenny's Journeys ($29.95) reinforces map reading skills. *Sound Tracks* ($29.95) allows children to compose and play music. *The Market Place* ($29.95) teaches basic economic concepts. *Discovery Lab* ($44) introduces the scientific process. And *Pets, Ltd.* ($43) allows children to select and care for a variety of pets.

MECC
3490 Lexington Ave., N.
St. Paul, MN 55112
(612) 481-3500
CIRCLE 432 ON READER SERVICE CARD

Floppy Disks

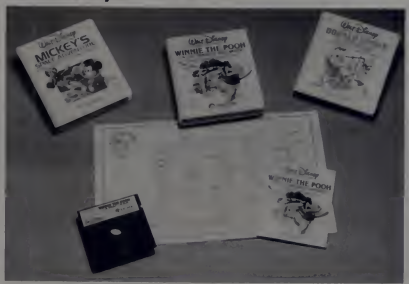
Fuji Photo Film USA has introduced 5.25" floppy disks for use with the 1.2Mb IBM PC AT disk drive.

Fuji Photo Film USA
Magnetic Products Div.
350 Fifth Ave.
New York, NY 10118
(212) 736-3335
CIRCLE 433 ON READER SERVICE CARD

Polaroid has introduced a line of 3.5", 5.25", and 8" floppy disks.

Polaroid
575 Technology Sq.
Cambridge, MA 02139
(617) 577-2000
CIRCLE 434 ON READER SERVICE CARD

Walt Disney Software



Walt Disney has entered the software business with three educational software packages programmed by Sierra On-Line for the Apple II, IBM PC/PCjr, Commodore 64, and Radio Shack Color Computer. All programs retail for $39.95.

Mickey's Space Adventure uses an adventure game format to teach children about our Solar System. *Donald Duck's Playground* promotes money-handling skills with an emphasis on change making. *Winnie the Pooh in the Hundred Acre Wood* develops mapping and reading skills.

Walt Disney Personal Computer Software
500 S. Buena Vista St.
Burbank, CA 91521
(818) 840-5965
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Graphics Software from AT&T

AT&T has introduced two graphics software packages for the AT&T 6300 equipped with either the AT&T Video Display Adapter or the AT&T Image Capture Board. Prices have not been set.

AT&T Paint and Image Processing Software features color manipulation, text overlay, merging of multiple images, drawing, and layout. It can also create NAPLPS frames for videotext services.

AT&T Business Graphics Presentation Software is compatible with *AT&T Paint* and is used to create two- and three-dimensional charts and graphs. It can use data from *Lotus 1-2-3*, *SuperCalc3*, and other spreadsheets and may be programmed to display a "slide show" of images.

AT&T
2002 Wellesley Blvd.
Indianapolis, IN 46219
(317) 352-6126
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Microsoft Macro Assembler

Microsoft has released a new version of its Macro Assembler. It supports the entire Intel family of 16-bit microprocessors, including the 8088, 8086, 8087, 80186, 80286, and 80287. An extensive set of program development utilities, including a new symbolic debugger, is included with the assembler. The Macro Assembler retails for $150.

Microsoft
10700 Northup Way
Box 97200
Bellevue, WA 98009
(206) 828-8080
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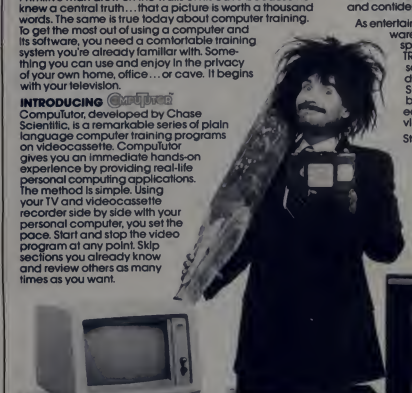
(Dealer and distributor inquiries welcome.)



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Using SuperSCRIPSIT™	(NA)	(NA)	
Using dBASE II®	(NA)		(NA)
Using dBASE III™		(NA)	(NA)
Using LOTUS™ 1-2-3™		(NA)	(NA)
Using FRAMEWORK™		(NA)	(NA)

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CHASE SCIENTIFIC 1311 Colorado Ave., Santa Monica, CA 90404
(Please allow 3-4 weeks for delivery)

☐ Yes, I am interested, but send me further information on: _____ (Program Titles)

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CC485

Educational Computing: Where Are We Now?

Betsy Staples

This issue of *Creative Computing* focuses on the use of computers in education—hardly a new idea. Universities and colleges have been using mainframes and minis in mathematics, statistics, and other quantitative subject areas for decades. Microcomputers have been worming their way into all levels of education for close to a decade.

Educational computing still has a long way to go, however, before it becomes the integral part of the educational process that computer literate parents and educators want it to be.

The problems faced by people who want to use computers as educational tools have changed over the years. It used to be that hardware was the primary obstacle. Early cassette-based Apple II's, TRS-80 Model I's, and Commodore Pets were balky beasts that could be relied upon primarily to fail when they were needed most. (How many contemporary computerists have ever heard the bone-chilling screech of a computer program being played through the speaker of a cassette player as its user searches for the correct volume?)

Disk drives were scarce luxuries—and far too temperamental (not to mention expensive) to expose to the rigors of classroom use. (The original line of Creative Computing Software included quite a few educational programs, but only two floppies.)

Today the computer hardware industry is of age. The new machines are far from flawless, of course, but for the most part, we can call them "reliable" with a straight face. The current generation of Apples, the capable Commodore 64, the old faithful Atari line, the newer Tandy models, and many other micros have proven their durability in countless classrooms around the world.

And disk-based systems are now the norm. Which brings us to the problem at hand: Now that most of the hardware hurdles have been overcome, the primary barrier to effective utilization of computers in education is lack of high quality software.

Yes, we've said it before, but unfortunately, it is still true that a great deal of the so-called educational software on the market today is worthless. We are reminded that it is true every month when we try to find worthy products to review in "Growing Up Literate." We find that the products of only a few manufacturers rise to the top of the pile month after month. So many of the others suffer from poor pedagogy, inadequate documentation, amateurish programming, lack of support, and a plethora of lesser ills. "How discouraging it must be," we think, "to be a parent or educator drifting helplessly in this uncharted sea of highly touted, expensive, and potentially useless software."

What's a mother (father, teacher, grandparent) to do? The most important thing is to make every attempt to preview educational software before purchasing it. This formal sounding "preview" can take any form from looking at a friend's copy to sitting through a formal presentation by a salesperson. Probably the most practical way is to ask an employee of your local computer store to let you play with a program for a few minutes before you decide whether to buy. Another way, of course, is to look for favorable reviews here in the pages of *Creative Computing*. But since space constraints allow us to evaluate only a few packages each month, we may never be able to publish the review you are looking for.

You can, however, apply the same criteria we apply to a package when you do your own evaluation. Long-time readers and those who keep up with "Growing Up Literate" probably have a pretty good idea what these are, but for new readers, we list them here in no particular order.

• Purpose. Different types of educational programs serve different purposes. The most obvious, and the easiest to program, is *drill and practice*. Drill and practice programs, many of which wear the guise of games, definitely have a place in the educational process, but they must not be confused with programs that actually teach. To make good use of a drill and practice program, the student must have some knowledge of the subject matter being drilled. A *tutorial* program that is designed to teach a series of concepts or facts can be used to advantage by almost any student in the recommended age range without prior introduction to the material. The last major category of educational software is *simulations*. Simulations use experience to teach both facts and concepts. Using a program that requires him to bring a malaria epidemic under control, for example, the student learns facts about mosquitoes, chemical pesticides, and treatment of disease. He also assimilates (painlessly, we hope) important ecological concepts.

• Documentation. The user's manual does not have to be fancy, but it should be well organized and free of spelling and grammatical errors. It never ceases to amaze us how many programs that claim to be educational come with error-fraught documentation. The user's manual should also tell you what the program is designed to accomplish—it should list educational objectives.

• Pedagogy. When we say that a program must be pedagogically sound, we mean that it must teach or drill facts and concepts that are worth knowing in a manner that is consistent with proven educational techniques. Asking the student, for example, to choose the correctly spelled word from a list of incorrectly spelled words is not pedagogically sound.

• Programming. The program should take advantage of the latest hardware advances and software innovations that your computer offers. Good graphics add to the appeal of a program, but if the student must sit idle while hi-res screens are loading from disk, he will soon come to think of them as an annoyance rather than an enhancement. There should always be a way to "give up" on a question or return to a menu without resetting the machine. Other good programming techniques are less obvious, but software written by an imaginative professional programmer will always stand out when compared with programs of lesser quality.

Obviously, there are many fine points to be considered in each of these categories. As you become familiar with good software (and bad) you will develop your own checklist and soon find that you can identify a quality package after only a few minutes of inspection. ■

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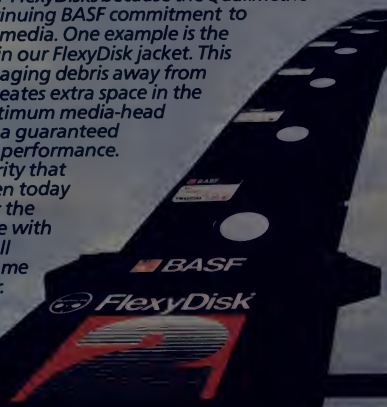

*Contact BASF for warranty details.

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Goodbye, Little Red Schoolhouse

This directory is intended to provide readers with an overview of the educational software market. The packages described here are representative of the software available from the various manufacturers, and the descriptions are based on information supplied by those manufacturers. Inclusion of a product in this listing does not imply that it has been evaluated or endorsed by the editors. For more information, contact the manufacturers directly (and please mention that you read about their products in Creative Computing).

American Educational Computer, Inc.

Basing its marketing approach on teacher-designed, curriculum-based programs, AEC uses a three-level approach in its software. Students must first complete an objective assignment and then can proceed to an action game using the information gained in the first stage. Finally, parents and teachers can add more advanced lessons geared to the child's abilities. *AEC Spelling* for grades two to eight features a basic 4233-word vocabulary which can be expanded as required. Basic grammar, vocabulary, geography, and Spanish skills are taught with *AEC MatchMaker*, which combines sound, interactive lessons, and graphics for all age ranges. *EasyReader* program topics include basic phonics, word structure, and comprehension skills and are organized to coincide with the regular grade school curriculum. Interactive procedures tailor the lessons to the individual student with the software keeping track of the users by name and progress level.

System: IBM PC, Apple II, C64, Atari

Address:

2450 Embarcadero Way
Palo Alto, CA 94303
(415)494-2021

Photography by Jeff MacWright.

Educational software graduates to new levels at school, home, and business

Carol A. Crowell

Artworx Software Company, Inc.

Filling in the missing link and introducing a monkey to educational software define the two distinctive product categories of Artworx. Three individual programs, *Math Factory, MonkeyNews,* and *MonkeyBuilder,* make up the Monkey Series for grades one to six, using Marc the Monkey to teach basic learning skills in arithmetic, reading, and spelling. *MonkeyBuilder,* a vocabulary building program, uses a heuristic design which automatically adjusts the difficulty level by evaluating the student's responses for accuracy and speed. Incorporating a memory device that associates a word with a vivid visual image, the *Linkword* foreign language series is designed to impart a conversational vocabulary of 400 words along with the basic rules of grammar in about 10 hours in Spanish, French, German, or Italian.

System: Apple II, C64, Atari

Address:

150 North Main St.
Fairport, NY 14450
(716) 425-2833

Ascension Designs A.D. 1984

Promoting the philosophy that the home computer is a useful tool for teaching Christian values and Bible-based principles, Ascension is marketing what it says are "non-denominational, non-doctrinaire educational programs designed to teach, reinforce and uphold spiritually enriching, life-building principles." Using graphics and animation, *Right Again!* is a game-tutorial program that employs an electronic angel to guide children ages 8 to 12 through Biblical history, stories, regions, and values. A book of Bible stories and geography also is included. Other Bible-based programs are planned both for additional age groups and as family-oriented activities.

System: IBM PC, Apple II, C64

Address:

6108 N. Western
Oklahoma City, OK 73118
(405) 848-5773

Avant Garde Publishing Corp.

A combination of error analysis and step-by-step demonstration that mirrors the actual teaching/learning process between teacher and student is the basis for four new programs in math and logic. *Introductory* and *Intermediate Algebra* programs provide progressive difficulty levels for grades eight through 12 with automatic timing and scoring so that students can compete against each other or the clock. *Logic Workout* introduces intermediate and high school students to classical logic and syllogisms with proof patterns and random combinations. *The Magic Cash Register* for younger children sets up a store with products, pricing and simulated purchases.

System: Apple II, C64

Address:

1907 Garden Ave.
Eugene, OR 97403
(503) 345-3043

Bantam Electronic Publishing

Following the trend of large book publishing houses entering the educational software field, Bantam Books is preparing to issue three lines of specialty programs after almost two years of development. The series are Selfware, a line of self-improvement software for adults; MicroWorkshop, learning games for children; and Living Literature, interactive fiction for all ages. Colorfully illustrated and generally based upon best-selling books, the software is designed to teach self-expression and deductive reasoning as well as self-improvement. *Fantastic Animals* is a learning game, for ages 4 to 9, that teaches animal and body part recognition and animal habitat identification. *Creative Contraptions,* for ages 7 and up, encourages children to create clever, humorous, and zany machines to accomplish everyday tasks.

System: IBM PC, Apple II, C64

Address:

666 Fifth Ave.
New York, NY 10103
(212) 765-6500

Batteries Included

Based upon traditional typing school methods, the *Keys to Typing* instructional software is a 32-lesson, six-week course for students from intermediate levels through high school that produces an average 40 words per minute typing proficiency. Featuring an error-proof, cursor-controlled menu, the program provides more than 400 individual exercises ranging from key introduction to specially designed typing games for reinforcing previous lessons and increasing speed.

System: C64

Address:

30 Mural St.
Richmond Hill, ON L4B 1B5
(416) 881-9941

Baudville

Making the computer scene with color graphics, animation, and courseware designed to illuminate the visual media, Baudville shapes interactive educational programs and companion libraries to a wide variety of age groups and applications. *Take 1* sets the stage with full color movie and cartoon capabilities, while the animation libraries allow the user to develop plots and characterization. *Heroes & Villains* and *Actors & Actions* provide an assortment of fully developed actors, actions, and scenes, allowing the user to become writer, director, and temperamental artist. The *Shape* libraries are electronic stencils and templates with text fonts and shape tables for astronomy, botany, chemistry, anatomy, and math.

System: Apple, C64

Address:

1001 Medical Park Dr., S.E.
Grand Rapids, MI 49506
(616) 957-3036

Brainworks, Inc.

Using a concept of discovery learning that incorporates fundamental intellectual skills such as logic, memory, and problem-solving, this company

claims that its software helps people learn how to learn. Its latest product, *Chipwits*, uses principles of artificial intelligence to teach robots to think for themselves while familiarizing the user with hundreds of behavioral combinations that could apply to real people in "real-life adventure situations." No programming knowledge is required; programming of the robots is accomplished with illustrated chips, or icons, that give the robots an almost unlimited variety of people-like qualities and behavior patterns. Robots are sent on a variety of dangerous missions of increasing difficulty, and in the event of failure, are brought back to the workshop for brain draining and re-chipping. Another mind challenging program is *BrainTrain*, which is designed to improve memory, to determine right or left brain dominancy, and to measure the improvement, if any, in both hemispheres.

System: Apple II and Macintosh
Address:
24009 Ventura Blvd.
Calabasas, CA 91302
(818) 884-6911

Broderbund Software

Mystery, muppets, and modules introduce a new Explorations series of "educationally entertaining software" for elementary and intermediate levels. The S.S. Microship sets sail in *Welcome Aboard, A Muppet Cruise to Computer Literacy* with passengers programming the vessel's course, glamorizing Miss Piggy with computer-aided designs, using word processing and electronic mail, and managing ship's comedian Fozzie Bear's database of truly terrible jokes. Castaways can find out where they are with *Where in the World is Carmen Sandeigo?*, an international mystery that comes with a *1985 World Almanac and Book of Facts* and a map of the world, and uses full-color animation and sound effects to teach geography and problem solving. *Science Toolkit* is a combination software and hardware package that turns the computer into a real science lab. Temperature- and light-sensing probes connect to the joystick port while on-screen instruments include a light meter, thermometer, timer, ohmmeter, and strip-chart recorder.

System: Apple II
Address:
17 Paul Dr.
San Rafael, CA 94903
(415) 479-1170

CBS Software

Time and the cycles of life have been preempted by CBS in its schedule of educational programs targeted for specific periods. The range of software and defined times include preschool, fun and learning, school, career, and leisure. Ages 3 to 6 can visit Sesame Street with *Big Bird's Special Delivery*, an object recognition and classification game. Turning 7 means turning on *Webster: the*

Word Game to learn spelling at progressive speeds and levels of difficulty. *Success with Math* covers number manipulation from basic arithmetic to quadratic equations, and every level from elementary to geriatric. *Mastering the SAT* and *Mastering the College Boards: English Composition* are self-paced, comprehensive programs for review and preparation. Adult education includes *Personal Development* and *Managing for Success*, self-paced, interactive programs that utilize case studies and simulations of day-to-day situations for practice and evaluation. Adults and older students can increase their leisure time by completing *Micro SpeedRead*. Twelve tangled webs of crime and puzzlement put powers of logic and deduction to the test with *Mystery Master: Murder by the Dozen*.

System: IBM PC, Apple II, C64, Atari
Address:
One Fawcett Pl.
Greenwich, CT 06386
(203) 622-2525

Commodore Business Machines, Inc.

Open-ended programs that run differently for each player, and differently each time they are used, is the goal of Commodore, a company that says its educational software can be used for a wide range of educational levels without becoming stale. For example, its *Just Imagine* program, which technically is for an age range of 4 to 14, can be used at the kindergarten level as well as for older children since the basic program can be altered to suit the differing needs of these groups. A creative writing program, this software contains a library of scenes and objects which can be combined to form pictures on the scene. The user then writes an imaginary story describing the activity. When the program is operated, the objects and people in the foreground are animated to form a continuous motion picture effect. *The Reading Professor*, for ages 12 to adult, is designed to increase reading speed and comprehension either as part of a school program or in independent study. The program consists of 10 lessons at four difficulty levels.

System: C64, Plus 4
Address:
1200 Wilson Dr.
West Chester, PA 19380
(215) 431-9100

Compu-Teach

Introducing a curriculum of integrated educational software, Compu-Teach says it is basing its instructional concept on providing children with a sense of control over the computer in order to create a feeling that the computer is responding to them. For young children beginning at age 2, *Sign Play* is an interactive program designed around the prevalence of signs, such as "Walk" and "Stop," in the everyday world. The object is to teach the child first to make the connection between words and signs with distinctive shapes and then to comprehend the letters on the signs as parts of a word independent of the shape and color of the sign. *Word Pieces* continues the process with drills to familiarize the child with the letters of the alphabet, provide ways of distinguishing between the letters, and then build the child's vocabulary.

System: IBM PC, Apple II
Address:
240 Bradley St.
New Haven, CT 06511
(203) 777-7738

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Data Processing Educational Corp.

Students and business people can learn computer literacy with Instant Tutor, a training series which currently includes tutorials covering how to use the IBM PC and DOS, *WordStar, dBase II*, and *SuperCalc* on the IBM PC and compatibles. Designed for computer novices, each program features eight to 10 self-paced, individual lessons with instructions, review sections, optional quizzes, and explanatory simulations. Users can follow the scan option for a quick overview of major topics or the study option for in-depth instruction. A reference guide includes additional practice exercises.
System: IBM PC
Address:
4588 Kenny Rd.
Columbus, OH 43220
(614) 457-0577

Davidson & Associates

Stressing motivation as the primary factor in encouraging students to increase basic skills in spelling, reading, vocabulary, and math, Davidson says its programs turn educational drudgery into educational fun. Animation, color, and optional sound effects enhance *Spell It*, a progressive spelling tutor and game combination that starts with 1000 of the most commonly misspelled words and incorporates spelling rules for ages 10 to adult. *Word Attack* is a vocabulary building system with words and sentences illustrating usage presented on nine different levels for ages 8 to adult. With more than 600 problems in basic arithmetic, including decimals and fractions, *Math Blaster* is targeted for ages 6 through 12 and allows parents and teachers to add additional problems. *Speed Reader II* is a reading development course professionally designed to increase speed and comprehension with 30 minutes of daily practice while providing a grade level analyzer to determine reading level and progress.
System: IBM PC, Apple II, and C64
Address:
6069 Grove Oak Place #12
Rancho Palos Verdes, CA 90274
(213) 373-0971

DCH Educational Software

In business for just under a century, D. C. Heath feels it knows enough about educational standards and requirements to offer a full 30-day trial on any of its classroom software products that cover grades K-12 in a wide variety of subjects. Computer aided instruction programs include graphics, tutorials, assignment and review capabilities, and interaction with managerial systems for tracking student progress and generating class lists and test results, as well as individual and class diagnostic reports. Among the products offered is *Quill*, a four-module software program that teaches writing skills and reinforces the importance of

planning, drafting, revising, and sharing writing with the help of a computer. The study of earth, life, and physical sciences is provided in the company's series of nine interactive programs that allow students to test ideas, work with simulations, and formulate hypotheses. *Ems Mathematics Software* consists of 19, test-independent programs grouped into course packages with color graphics, tutorials, and drill and practice activities.
System: IBM PC, Apple, C64, TRS-80
Address:
125 Spring St.
Lexington, MA 02173
(800) 428-8071

DesignWare

Coming to the aid of parents who need to encourage their children to do homework, DesignWare has developed a series of interactive educational programs that blend teaching with entertainment. Easily customized to supplement current school assignments, the programs cover core subjects and basic skills at several difficulty levels for students ages 5 to 18. As a reporter on *The Grammar Examiner*, children learn grammar skills by editing hundreds of humorous news stories. Family history can be added to *States & Traits*, a course in U.S. geography that discusses land forms, trivia, and locations of historic events. Solving groups of equations in *Mission: Algebra* helps rescue a stricken space ship while the computer monitors the student's progress.
System: IBM PC, Apple, C64, Atari
Address:
185 Berry St.
San Francisco, CA 94107
(415) 546-1866

EduWare

A comprehensive line of tutorial and simulation software that emphasizes a one-on-one learning situation between an enthusiastic student and the undivided attention of a very smart, endlessly patient instructor is the special pervue of this company with programs for pre-teens to adult. Typical of this approach is *Wilderness*, a survival simulation that draws upon interrelated databases dealing with weather, topography, animal and plant life, and health conditions specific to particular geographic areas of the world. Using a graphics generating system that creates three-dimensional panoramas which change depending upon the player's point of view, the game provides two survival scenarios for players trekking through the unknown. There are 10 levels of difficulty and an assortment of toxic plants, inclement weather, and agitated wildlife.
System: Apple II, C64
Address:
28035 Dorothy Dr.
Agoura Hills, CA 91301
(818) 706-0661

Electronic Courseware Systems, Inc.

While extensive music software is the keynote of ECS, managing a classroom learning environment is the hallmark of the company's educational philosophy. Three Midi-Musicware programs using an interface board, synthesizer, and the computer are designed to teach basic skills in music. *Keyboard Note Drill* increases speed in identifying notes randomly placed on the bass and treble staves with response time adjusted to the level of difficulty. Increasing tonal memory of a series of pitches played by the computer is the goal of *Super Challenger*, an aural-visual game. *Keyboard Jazz Harmonies* is a six-part program

developed to teach chord symbols, 7th-chord recognition, and chord spelling. *Practical Music Theory*, *Music Terminology*, and *Early Music Skills* are designed to educate music students of all ages and maintain records of progress. The company also offers some programs in math and English grammar.
Systems: IBM PC, Apple II, C64
Address:
309 Windsor Rd.
Champaign, IL 61820
(217) 359-7099

Epcot Educational Media

In keeping with Epcot's science and technology theme, Disney's Epcot Educational Media has introduced three programs in science and business for junior high school students and older. *Internal Journey* uses an interactive format, color graphics, animation, and music to teach nutrition and the process of food digestion and conversion in humans. As energy scientists in *Galactic Prospector*, students conduct geological and meteorological tests and evaluate data to find available energy sources on a new planet. A simulated amusement park in *Cosmic Carnival* is the setting for students to learn about the energy costs and operating expenses of managing a business.
System: Apple II
Address:
500 South Buena Vista St.
Burbank, CA 91521
(818) 840-5290

Epyx Computer Software

Gearing its software products to strategic thinking and adventure-role playing, this company strives for what it feels is the optimum balance between educational material and entertainment in its Learning Fun series for 6- to 12-year-olds, with typing and logic programs for ages 6 to 60. Based upon the movie of the same name, Epyx's *9-5 Typing* program combines seven basic typing skills and 49 drills with animated sequences from the motion picture. Players can increase speed by taking potshots at Hart in a shooting gallery or learn key locations by helping Doralee escape from Hart. Epyx also is releasing its own version of *Chipwits*.
System: IBM PC, Apple II, Atari, C64
Address:
1043 Kiel Ct.
Sunnyvale, CA 94089
(408) 745-0700

Fisher-Price

The 12 and under class is a special prerogative of this company that specializes in tot to pre-teen educational games designed to make computer literacy and basic learning skills fun. *Movie Creator* is a new product that teaches children 6 to 10 to create colorful, fully animated movies complete with a music soundtrack and a script. *SongMaker* lets children play or modify 15 traditional songs or create their own musical compositions. Auditory and visual cues, along with animated animals, introduce the child to concepts of musical pitch. *Up & Add 'Em* helps children from 3 to 7 learn basic counting, addition and subtraction. *Logic Levels* encourages logical thinking and helps children 7 to 12 learn to predict the outcome of a series of actions. A complete catalog of educational games is available from the company.
System: Apple II, C64
Address:
P.O. Box 1327
Cambridge, MA 02238
(617) 494-1222

FlipTrack Learning Systems

With a variety of training courses on microcomputer operations and software, FlipTrack teacher cassettes put a personal tutor into the classroom or office. Nothing is simulated in these hands-on, user-paced courses that provide about two hours of instruction per cassette. A clear, concise index and special formatting system allow the user to select specific topics for study or review without going through the entire tape. Cassettes are available for both professional and home computers, word processing software, including *Apple Writer*, *EasyWriter II*, and *WordStar*; spreadsheets, including *Multiplan*, *Supercalc*, and *Visicalc*; and the integrated packages *Framework* and *Lotus 1-2-3*.
System: IBM PC, Apple II, Atari, C64, Vic-20, Coleco
Address:
999 Main, Suite 200
Glen Ellyn, IL 60137
(312) 790-1117

Grolier Electronic Publishing, Inc.

It should be no surprise that the world's largest publisher and distributor of encyclopedias would introduce a line of educational software designed not only to encourage reading but also to develop "essential information literacy" skills. The Adventures in Knowledge series integrates books and software in *Secrets of Science Island* which uses adventure to explain science facts. Using an authoritative reference book about explorers, *Treasure Hunters* promotes reading in history and geography through a global quest for buried treasure. A resource book offering additional learning activities for use by instructors, parents, and students is included with each software package. *Step One* for beginners and computer novices is an interactive program which uses nine learning modules for developing skills ranging from writing and editing to using the computer as a fully functioning, simulated piano.
System: Apple II, C64
Address:
95 Madison Ave.
New York, NY 10016
(212) 696-9750

Hartley Courseware, Inc.

Composed of colorful, interactive computer readiness games, Hartley's *Early Discovery* series for pre-schoolers uses sound and animation to encourage interest and concentration through increasing difficulty levels. *Color and Shapes* combines discrimination of the title elements with reinforcement of top-to-bottom and left-to-right eye movements that will be required in future reading. *Patterns and Sequence* begins with matching single objects and progresses through abstract patterns in series to filling in the parts of missing letters. For high school students, the company produces *Intellectual Pursuits* with questions from English and American literature as well as mythology. Deductive reasoning to promote logical thinking is the goal of *Perplexing Puzzles*, a program that helps the beginning fourth to tenth grade student, but leaves advanced students on their own. *Kittens, Kids, and a Frog* for first and second graders is designed to develop inferential and factual comprehension. For children in grades three and four, the company offers *Reading for Meaning II with Mother Goose*.
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(517) 646-6458

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MAYNARD. Controller Card w/ piano part — $ 300 — $ 195
Controller Card w/ serial port — $ 310 — $ 195
Sentinal Cont Card (accepts 3 modules) — $ 75 — $ 49
PERFECT DATA. Head Cleaning Kit — $ 10 — $ 12

OTHER HARDWARE

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AST	PRICE	PRICE
SixPlus Plus. 64K		CALL
SixPlusPlus. 256K S/P/CC+5/W	$ 695	$ 395
SixPlusPlus. 384K S/P/CC+5/W	$ 895	$ 495
Game Port for SixPak	$ 50	$ 39
Preview™ Graphics Card w/ opers. 64K	$ 399	$ 299
Advantage™ Multif. Bd for AT	$ 595	$ 445
I/O Plus II S/P/CC	$ 215	$ 150
I/O Plus II S/P/CCG	$ 295	$ 195
I/O Plus III 2S/P/CCG	$ 315	$ 215
MonoGraphPlus™ P/CC (ReValue)	$ 495	$ 375
PCNet. Starter Kit (2 PCXT)	$1095	$ 750
PCNet. Circuit Board. PC201	$ 695	$ 395
ComboPlus Products IN STOCK		CALL
MegaPlus Products IN STOCK		CALL
COMAX. BEE		
Econo RAM Plus™. 384K to 1.5 meg		$395
Board. S/P/CC/G/ Fasmtak™ & Spooler		
EconoRAM™ full 384K board	$ 595	$ 325
CURTEL. 14" RGB Monitor w/ swivel base	$ 50	$ 30
3 9 Inch Keyboard Extension Cable	$ 40	$ 30
HAUPPAUGE DIGITAL WS. 8087 Chip	$ 175	$ 125
8087 Math Pac (Chip & Softw)	$ 295	$ 235
8087 Software Only	$ 140	$ 130
8087 Micro Pak	$ 245	$ 195
HAYES. Micro II Joystick	$ 45	$ 30
HERCULES. Color Card w/ opers	$ 245	$ 189
Mono Graphics Card	$ 499	$ 349
KAMEIHAN. External Power Supply	$ 395	$ 295
KEITHLEY/METROBYTE. Mpx-16	$ 595	$ 395
PC Sync™ Cote Cont w/ 4 mo	$ 50	$ 35
KEYTRONIC. 5151 (5010) Sml. keyboard	$ 195	$ 150
5272 PC/AT (5020)	$ 295	$ 195
KOALA. Sweet Key System	$ 100	$ 53
Koala Key Tablet w/ softwares	$ 200	$ 139
Koala Pad™ w/PC Design	$ 150	$ 99
Programmer's Guide	$ 15	$ 12
MAYNARD. SAND STAR SERIES		
Multifunction (E) Card	$ 89	$ 79
Memory Card no RAM	$ 199	$ 169
Memory Card 256K	$ 465	$ 395
Floppy Cont. Card. accepts 3 modules	$ 265	$ 209
HardDisk I/F Module	$ 499	$ 395
HardDisk Cable	$ 39	$ 29
Serial Port Module	$ 85	$ 79
Para or Clock Cal. Module ea	$ 59	$ 49
Battery Backup Module	$ 49	$ 39
Memory Module. 0K	$ 122	$ 89
Memory Module 256K	$ 429	$ 349
10 meg Hard Disk Kit & Cont Card	$1595	$1150

OTHER HARDWARE

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	PRICE	PRICE
MICROSOFT. Mouse for PC	$ 195	$ 138
System Card 64K	$ 395	$ 275
System Card 256K	$ 625	$ 450
MOUSE SYSTEMS. PC Mouse & Paint	$ 295	$ 199
PANASONIC. Modular Graphics Card	$ 395	$ 295
Parallel or Serial Port ea	$ 95	$ 65
PERSYST. BEE		
PC/Mono Board. w/opers port	$ 250	$ 195
PC/Color Graphics Bd. w/light pen & I/F	$ 249	$ 178
Multi Function/Color Adapter. hi res	$ 595	$ 469
PLANTRONICS.		
Color Bd. & Cartridge. 16 color w/Para	$ 595	$ 395
Color Bd & Draftmaster. 16 color w/Para	$ 695	$ 395
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Quadboard 64K. to 384K S/P/CC/G	$ 395	$ 245
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Quadboard 256K. to 384K. S/P/CC	$ 675	$ 395
Quadboard. 384K. S/P/CC/G	$ 695	$ 395
Quadboard II. no RAM. to 256K	$ 295	$ 215
Quadboard II. 64K. to 256K. 2S/2C	$ 395	$ 265
Quadboard II. 256K. 2S/2C	$ 595	$ 395
Quad 512 + 64K w/serial port	$ 325	$ 265
Quad 512 + 256K w/serial port	$ 550	$ 420
Quad 512 + 512K w/serial port	$ 650	$ 495
Quadcolor I board. 4 colors	$ 295	$ 195
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Quadver VI	$2295	$1545
Quadnet IX	$2895	$1745
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MICROSOFT SYSTEMS. Mouse for jr	$ 195	$ 138
MICROSOFT. 128K Booster w/Mouse	$ 495	$ 329
Memory Module	$ 195	$ 129
QUADRAM. Quadmemory (128K-512K P/CG)	$ 275	$ 215
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dBase III. req. PC DOS & 128K)	$ 495	$ 295
dBase II to III upgrade	$ 195	$ 125
ATI. Training Programs —Large Inventory	$ 75	$ 50
BPI. Job Cost Accounting	$ 795	$ 495
Gen'l Acctg. A/R. A/P or PR each	$ 595	$ 375
BRODERBUND. Bank St. Writer(PC or jr)	$ 70	$ 49
CDEX. Training Programs —Large Inventory	$ 70	$ 49
CONTINENTAL. Ultra-site (PC)	$ 195	$ 129
Tax Advantage (PC or jr)	$ 70	$ 45
FCM (Fin'l Calculations, Mailing)(PC)	$ 195	$ 129
Property Management (PC)	$ 495	$ 295
DOW JONES. Investment Evaluator	$ 139	$ 89
Market Manager Plus	$ 300	$ 159
Market Analyzer	$ 300	$ 159
Market Microscope	$ 350	$ 219
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HARVARD. Total Project Manager	$ 495	$ 315
Total Project Manager II	$ 695	$ 395
HAYDEN. Pic Rite	$ 70	$ 49
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LIFETREE. Volkswriter Deluxe	$ 395	$ 159
Volkswriter	$ 195	$ 109

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	LIST	CORPORATE
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LOTUS. 1-2-3	$ 485	$ 309
Symphony	$ 695	$ 469
MDBS. Knowledgeman	$ 500	$ 300
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MICROPRO. WordStar™ (PC)	$ 350	$ 185
WordStar2000	$ 495	$ 295
WordStar 2000	$ 495	$ 295
WordStar Pro Pkg Plus	$ 595	$ 395
WordStar Professional Pkg	$ 695	$ 395
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InfoStar (Pro Pkg. Plus) (WS/SG/SI)	$ 695	$ 395
InfoStar Plus (+ Starburst)	$ 595	$ 315
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RBase Compiler/Runtime	$ 150	$ 95
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MULTIMATE. Multimate Ver. 4.0	$ 395	$ 295
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PEACHTREE. Back to Basics Kit	$ 295	$ 175
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SAMNA. Word Plus	$ 795	$ 185
SAMNA. WordPerfect (PC)	$ 495	$ 295
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SOFTWARE INT'L. Open Access	$ 695	$ 395

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PFS File	$ 140	$ 89
PFS Write	$ 140	$ 89
PFS Graph	$ 140	$ 89
PFS Plan	$ 140	$ 89
PFS: Prod or PFS Access. each	$ 95	$ 59
RORCHA. Accountant	$ 595	$ 245
STONE WARE. Advanced DM Master	$ 545	$ 395
THORN/EMI. Perfect Writer (PC)	$ 395	$ 295
Perfect Combo (Writer & Speller) (PC)	$ 399	$ 188
Perfect Combo (Writer & Speller) (PC)	$ 399	$ 188
VISICORP. VisiCalc 4	$ 250	$ 156
WARNER. Dam Programs (PC or jr)	$ 195	$ 129

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BORLAND. Sidekick (PC or jr)	$ 55	$ 35
Sidekick (Expanded) (PC or jr)	$ 85	$ 55
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Turbo Pascal	$ 70	$ 45
CENTRAL POINT. Copy II PC	$ 40	$ 30
DIGITAL RESEARCH. RAM-Disk emulator & printer spooler (PC, PCjr, Compaq, 8088-based Macs)	$ 70	$ 49
KOALA. Grafix Interface	$ 80	$ 39
CBASIC 86™ (CP/M-86)	$ 200	$ 135
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Concurrent CP/M-86™ w/windows	$ 695	$ 225
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Speed Prog. Pkg. (CP/M-86)	$ 200	$ 135
DR LOGO (CP/M-86)	$ 150	$ 100
EPYX. In Stock	$ 395	$ 295
FUNK SOFTWARE. Sideways	$ 60	$ 40
HAYES. Smartcom II (Data Comm.)	$ 149	$ 99
LIFE BOAT. C Compiler	$ 300	$ 195
MICROSTUF. Crosstalk XVI (PC or jr)	$ 195	$ 129
MICROSOFT. Basic Compiler	$ 195	$ 129
BASIC Compiler	$ 300	$ 250
Business BASIC Compiler	$ 600	$ 450
C Compiler	$ 350	$ 250
C Cross Compiler	$ 500	$ 350
FORTRAN Compiler	$ 350	$ 250
PASCAL Compiler	$ 300	$ 199

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	PRICE	PRICE
MOUSE SYSTEMS. PC Paint	$ 95	$ 65
NORTON. Utilities (14 progs) New Version	$ 160	$ 65
OPEN SYSTEMS. BASIC Interpreter	$ 195	$ 130
ROSESOFT. Prokey	$ 139	$ 79
WESTERN UNION. Easy Link Mail Mng	$ 95	$ 65

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ARMONK. Executive Suite	$ 40	$ 27
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CONTINENTAL. Home Accountant (Jr)	$ 75	$ 59
Home Accountant Plus (PC)	$ 150	$ 99
DOW JONES. Home Budget	$ 139	$ 89
KOALA. Graphics Extentor (Jr)	$ 80	$ 39
MONOGRAM. Dothats & Sense w/Icecast	$ 165	$ 110
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Howard W. Sams & Co., Inc

Believing that computer literacy also requires the ability to read and comprehend printed media, this company takes the approach that an educational package consists of a full-length book supplemented with a disk or tape cassette containing program material the reader would otherwise need to enter by hand. Among the offerings is the *Trivia Data Base* series which uses the popular trivia motif as the method of teaching database program structure. This "Combo Pack" contains two separate programs, the first a database management system, and the second a game for one to four players which accesses that data and scores points for prompt and correct responses. Ages child to adult can learn structured programming and Logo syntax with *88 Apple Logo Programs* which contains ready-to-run database and graphing packages for home, business, and school. Other programs are designed for ages 10 to 14.

System: Apple II, C64, Atari

Address:

4300 W. 62nd St.
Indianapolis, IN 46206
(317) 298-5566
(800) 428-SAMS

Human Engineered Software

HES's human engineers are promoting the spread of disease among microcomputers, but the epidemic can be brought under control by 10-year-olds using *Cell Defense*, a biology program that simulates the effects of virus, age, stress, drugs, and alcohol on individual cells. Users control the body's defense system to ward off infections and tissue damage by choosing from a variety of defenses including interferon, macraphages and antibodies. Another interactive, simulation program, *Ocean Quest*, challenges players to roam the seven seas in a research submarine, collecting data on marine life while searching for shipwrecks, sunken treasure, and lost torpedos.

System: Apple II, C64

Address:

150 North Hill Dr.
Brisbane, CA 94005
(415) 468-4111

IBM

With programs developed specifically for the IBM PCjr ranging from an earth science series to games that build logic skills, Big Blue is offering special school prices to introduce its products to teachers and other fulltime faculty members. Its *Writing to Read* system is a complete language laboratory for teaching kindergarten and first grade children to read and write. Prior to the introduction of the program, more than 22,000 children participated in a full scale testing and evaluation of the system. IBM also produces an Electric Literature series that includes the *Electric Poet*, a program of animation and musical lessons created for language arts, social studies, science, and math. In conjunction with the *Poet, Comma Cat* uses poetry, color, animation, and music to teach the appearance and use of punctuation marks. *Dictionary Dog* teaches children how to alphabetize words and to use the dictionary.

System: IBM PC, PCjr.

Address:

P. O. Box 1328
Boca Raton, FL 33432
(305) 982-3474

Imagic

An enterprising crook could chat with his computer, repair his car on the way to a heist and preside at his own trial with this company's line of software. *Speak and Seek* is a vocabulary building program for children 2 to 7 years old that uses speech synthesis programming instead of specialized hardware to create talkative, animated letters. *Injured Engine* takes older children and their computers under the hood of a car to learn about operation and maintenance. *Crime and Punishment* draws on actual case histories to present criminal trials, examine evidence and testimony, analyze defendants' records of arrests and convictions, and determine sentences.

System: IBM PC, Apple II, C64

Address:

981 University Ave.
Los Gatos, CA 95030
(408) 399-2200

Krell Software Corporation

For career-oriented adults who need to review grammar and English usage, and students who are preparing for junior high, high school, and college entrance exams, Krell offers *Grammar, What Big Teeth You Have*, a diagnostic and instructional program that covers grammar, style, punctuation, and spelling. A complementary package, *The Devil and Mr. Webster*, uses a tutoring and game format to teach roots, prefixes, foreign words, and 9000 essential vocabulary words. Krell also produces preparation packages for the SAT, ACT, GMAT, LSAT, and NTE, with SAT and ACT programs offering a money-back guarantee of an 80-point SAT score increase and a 10% ACT score increase. For young learners, *Kinderlogo* introduces Logo programming language for teaching computer literacy.

System: IBM PC, Apple, C64, Atari, TRS-80

Address:

1320 Stony Brook Rd.
Stony Brook, NY 11790
(516) 751-5139
(800) 245-7355

The Learning Company

Designing programs in series so students progress from one to the next, TLC produces a wide range of educational software in logic and thinking skills, reading, math, and art and creativity. An electronic erector set that builds logic machines and simulated computer circuits, *Rocky's Boots* for ages 9 and up is an introductory logic course in which the player becomes a builder and inventor, tinkering and experimenting in an interactive environment. Teenagers and young adults can build a robot, design integrated circuitry and microchips and learn the applications of Boolean logic in *Robot Odyssey I*, an adventure game that combines action and education. Players develop problem-solving skills, including analysis of information, hypothesis formulation, and logical thinking. Other TLC software includes reading programs for ages 3 to 10, math for ages 4 to 13, and art and creativity for ages 3 to 6.

System: IBM PC, Apple II, C64, Atari

Address:

545 Middlefield R., Suite 170
Menlo Park, CA 94025
(415) 328-5410

MECA

An interactive, self-paced tutorial designed to introduce novices 12 to adult to Basic programming, *Basic Building Blocks* demonstrates Basic commands, including disk access, sound, and graphics. More than 60 programs are executed for study to teach program structure and flow of control. In addition, users can write and test their own programs, tracing the flow one line at a time to detect er-

rors. Values for up to 16 variables can be displayed and breakpoints set by line number or variable number.
System: Apple, Atari, IBM PC
Address:
285 Riverside Dr.
Westport, CT 06880
(203) 222-1000

Methods & Solutions, Inc.

Based on the theory that children view school as a job and reject tutorial educational programs for use at home as being part of the workday even when presented on a computer, the Mindplay series incorporates learning into a variety of information-laden games to attract and maintain interest and enthusiasm. The software also is adjustable by teacher or parent according to the motor skills and educational progress of the individual child. *Race the Clock*, for ages 5 to 12, is designed to sharpen memory and thinking skills as the user races against time to match pictures, words, and word-picture combinations. Children aged 4 to 9 can knock down walls and slay an assortment of monsters in the addition and subtraction game, *Math Magic*, which includes performance summaries and customizing features. Story and coloring books can be created by children ages 4 and up with *Picture Perfect*. For children 7 to 11 who would like to eat their words, the diet can be made palatable with *Bake & Taste*, a program that teaches how to measure and follow directions.
System: IBM PC, Apple II
Address:
82 Montvale Ave.
Stoneham, MA 02180
(617) 438-5454

Micro Lab

The Micro Learn Tutorial Series uses two basic modes in its educational programs, a tutorial mode in which answers to questions are explained immediately after a choice is made, and a test mode in which questions are answered without help and then scored on the basis of the percentage of correct answers. Missed questions are regiven after scoring. *American History*, ages 7 to adult, covers 1865-1912 with topics including reconstruction, industrial growth, urban growth, and foreign policy. Seventh through twelfth graders explore exponents, scientific notation, and problem solving in *More Power to You*. Stories of monsters, superstitions, and magical happenings develop comprehensive reading skills in *Myths, Magic and Monsters* for grades 5 to 8.
System: IBM PC, Apple II, C64, Atari
Address:
2699 Skokie Valley Rd.
Highland Park, IL 60035
(312) 433-7550

Mindscape, Inc.

A new series for young children and a real-time space program are the newest entries in this company's line of educational and entertaining games. *The Halley Project: A Mission in Our Solar System* is a solar system simulation that takes teen to adult players through a series of tests and obstacles while imparting information on gravity, orbital motions, and sizes and positions of planets, comets and moons; location of constellations; and how eclipses occur. Children 4 to 8 years old help Tonk search for robot parts in Buddy-Bot land in *Tonk in the Land of Buddy-Bots*, one of five educational games in the Tink!Tonk! series designed to develop concentration, visual discrimination, and critical thinking skills over a range of five difficulty levels.
Systems: IBM PC, Apple II, C64, Atari
Address:
3444 Dundee Rd.
Northbrook, IL 60062
(312) 480-7667

Minnesota Educational Computing Corporation

With more than 300 software programs listed in its 94-page catalog, MECC is one of the industry leaders in developing a wide variety of educational materials for home and school use. A new science package, *Discovery Lab* introduces students to science processes by predicting, observing, and collecting information. For grades five to nine, two interactive tutorials, *Diagonals* and *Squares* in the Problem-Solving Strategies series, detail the strategies of trial and error, exhaustive listing, and simplification of the posed problem. Students collect data, create charts, find patterns, and make generalizations as the strategies are applied to graphically presented puzzle problems. Young Commodore 64 tyros can learn the ins and outs of the system with *The Friendly Computer* and the *Term Worm*, a program that graphically displays the major components of the computer innards. Many MECC software packages are also available directly from Radio Shack
System: IBM PC, Apple II, C64, TRS-80, Atari
Address:
3490 Lexington Ave. N.
St. Paul, MN 55112
(612) 481-3500

Muse Software

Muse is a company that actually says it wants to turn children into addicts—education addicts who enjoy the experience of learning. Taking its lead from the news headlines, the company puts young players into the middle of a nuclear power plant with *Three Mile Island*, where the general manager must supply electricity to customers while preventing radiation leaks, interruption of service, and most important, a meltdown. More cerebral is *Intellectual Decathalon*, an Olympic brain-against-the-clock race designed to stimulate powers of observation, memorization and competition for ages 6 to adult. Mathematical functions over a wide range of variables in alegbra and calculus are presented in *The Functional Game* which explores the association between graphs of functions and their mathematical equations for high school and college level students. Losers here can always refresh their knowledge of *Elementary Math* in a program of basic arithmetic for 6- to 13-year olds designed to supplement homework assignments.
System: Apple II
Address:
347 Charles St.
Baltimore, MD 21201
(301) 659-7212

Olympus Educational Software

Featuring color and graphics capabilities, Infinite Math Workbook Series offers 14 programs covering three years of high school math curriculum, including functions and graphing, geometry, linear equations, and statistics. Each program provides instruction, review, examples, and scoring. After a user's third unsuccessful attempt to solve a problem, the program provides both the solution and detailed explanations of the mathematical process. Highly tutorial, these programs may be used in classrooms as supplements to the on-going curriculum or as reviews in independent study. Accompanying booklets act as mini-textbooks, each providing a discussion of a specific area of mathematics.

System: Apple II, C64
Address:
1660 North Hotel Circle Dr.
Suite 310
San Diego, CA 92108
(619) 296-8475

Prentice-Hall

Developed by Arrakis Advantage for Prentice-Hall, *Algebra I, Geometry*, and *Chemistry* are the first in a series of interactive math and science programs that eventually will include volumes of biology, physics, and statistics. Students are allowed to interrupt to ask questions, request examples, or review material and can use two different testing techniques to prepare for classroom exams. Each program covers a specific set of key topics: sets and their notation, types, operations, and relationships in *Algebra I*, Volume 1; applications, measure, basics of geometry, relations, and transformations in *Geometry*, Volume 1; and atomic models, Dalton's atomic theory, and electron configurations in *Chemistry*, Volume 1. Animated color graphics, simulations, and sound are designed to create interest and enthusiasm in high school students.

System: IBM PC, PCjr, Apple IIe, Atari, C64
Address:
Englewood Cliffs, NJ 07632
(800) 624-0024

Quality Educational Designs (QED)

Self-paced tutoring and game-explorations are combined in four interactive programs that introduce, instruct, reinforce, and then extend basic mathematical concepts for students in grades two through nine. Beginning with trial and error, *Arith-Magic II* uses concrete examples in length, area, and volume to develop abstract concepts. Four levels of difficulty challenge individual ability. *Factoring Whole Numbers* is an interactive tutorial and activity package requiring students to give problems to the computer which then requires students to solve those problems. *Fractions* and *Decimals* are progressive programs requiring constant interaction with decision making, questions and answers, and concept demonstration.
Systems: Apple, TRS-80, C64, Pet
Address:
P. O. Box 12486
Portland, OR 97212
(503) 287-8137

Rand McNally Educational Publishing

For a company that made its name in cartography, it seems natural to chart a geographic course in educational software with four programs that explore the land and its relationship to society, history, and the elements. *Choice or Chance?* helps intermediate students understand the cause and effect of historical happenings as they relate to

geography with interactive lessons in exploration, colonization, expansion, and industrialization. *Time and Seasons* for grades seven to nine, demonstrates how time is measured and regulated, seasonal differences between hemispheres, and longitude and time lines. *Unlocking the Map Code* deciphers topographic symbols, scales and color theory. Basic concepts, terminology, and the use of barometers, thermometers, and hydrometers are taught in *Weather or Not*, a meteorological study of world climatic conditions.
System: Apple II
Address:
8255 N. Central Park Ave.
Skokie, IL 60076
(312) 673-9100

Random House

Vivid color graphics and lifelike animation put the Peanuts characters to work in a series of family-based educational programs developed by one of the leading publishers of children's books. Special activities and color cards are designed to allow children ages 3 to 7 to share the learning experience with their parents in *Charlie Brown's ABC's*, which uses humorous situations to introduce the alphabet. The letters become building blocks in word families generated by *Snoopy's Reading Machine*, a program that rewards correct answers with an action sequence and advancement to the next skill level. Logic and coordination skills are developed as children ages 4 to 8 help the Peanuts gang find the way out of the *Maze Marathon*. This program draws new mazes each time with the puzzles gradually growing more difficult. The flying ace is back in Snoopy's *Skywriter Scrambler*, an action game for ages 8 to adult that tests wits and skill with word puzzles. When Woodstock is birdnapped, Snoopy the super sleuth involves children ages 8 and up in a mathematical game, *Snoopy to the Rescue*, that uses addition to accomplish the rescue.
System: Apple II, IBM PCjr, C64
Address:
201 East 50th St.
New York, NY 10022
(212) 872-8035

Scarborough Systems, Inc.

Blending educational elements with practical home applications and entertainment, The Scarborough System manufactures a range of instructional software for students and their families. Teens and adults are confronted by the economics and managerial challenges of building a successful manufacturing enterprise in Tom Snyder's *Make Millions*, which casts the user as a chief executive officer faced with problems of inventory control, research, productivity, pricing, competition, and advertising. Children ages 2 to 12 become the central character in the interactive *Build a Book* program that weaves friends, family, and pets into a personalized story that can be printed out and bound into a durable, professional quality, four-color book. Other programs include *Songwriter*, which comes with connector cables to couple the computer with a home stereo and reproduce the musical compositions of child or adult, and *MasterType's Figures + Formulas*, a weights and measures conversion program so complete it will convert hogsheads to liters and the speed of light to furlongs per fortnight.
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CIRCLE 126 ON READER SERVICE CARD

Scholastic, Inc.

Using a combination of interactive techniques and simulated life experiences, the Scholastic Software series provides graphic and challenging learning opportunities in science, math, language arts, and computer literacy. Users can perform a simulated dissection of a frog, complete with scissors and other tools for cutting out the proper organs, animated sequences of organ functions such as the beating of the heart, and discussions of biology and anatomy, in *Operation: Frog*. Children ages 8 and up can write and illustrate their own stories with *Story Maker: A Fact & Fiction Tool Kit* that combines reading readiness and comprehension with the fundamentals of computer graphics, or uncover parts of *Mystery Sentences*, in a home and classroom program that sharpens verbal and analytical skills.
System: Apple II
Address:
730 Broadway
New York, NY 10003
(212) 505-3000

Sierra On-Line, Inc.

Mickey Mouse, Donald Duck, and Winnie-the-Pooh have been enlisted in Sierra's "child-friendly" software designed to provide a learning environment rich in entertaining and educational experiences. Designed for children ages 7 and up, *Winnie-the-Pooh in the Hundred-Acre Wood* develops mapping and reading skills as the child has to map a path through the woods to find several groups of lost objects. *Donald Duck's Playground*, for ages 7 to 11, promotes money-handling skills along with shape, color, and letter pattern recognition. America's favorite rodent takes the 8-year-old player in a journey through the solar system in *Mickey's Space Adventure*, developing problem-solving skills, logical thinking and mapping ability as the child pilots the spaceship among the planets in a search for fragments of a lost memory crystal.
System: IBM PC, PCjr, Apple II, C64
Address:
Sierra On-Line Building
Coarsegold, CA 93614
(209) 683-6858

Simon & Schuster

Not content with being a power in book publishing, or maybe because of that, Simon & Schuster has developed an educational software program that allows students to mix, heat, and combine chemicals on the screen. Putting young chemists, ages 9 to 13, in charge of a computerized chemical laboratory, *Chem Lab* comes equipped with two robot arms for handling chemicals and equipment, three Bunsen burners and separate dispensers for gases, liquids, and solids. If the computer survives all this, younger children, ages 4 and up, can wreak havoc with *The Great Gonzo in Wordrider* and *Kermit's Electronic Storymaker*. These Muppet Institute of Technology programs are designed to develop reading, writing, grammar, and vocabulary skills. The company also produces *Typing Tutor III* and *Lovejoy's Preparation for the SAT*.
System: IBM PC, Apple, C64
Address:
1230 Avenue of the Americas
New York, NY 10020
(212) 398-0820

SofTech Microsystems

SofTech has developed a number of products to meet classroom instruction requirements for UCSD Pascal and Fortran-77. *The UCSD Pascal Learning Environment* includes a completely integrated, student-friendly operating system, an editor that doubles as a sophisticated text processor, and screen formatting routines, graphics, sound and color capabilities. The compiler allows students to create programs of up to 2000 line of code using up to six units. *The UCSD Pascal Development Environment* provides instruction for beginning classes through advanced operating system architecture courses.
System: IBM PC, Apple, DEC Rainbow, Sperry, Mitsubishi
Address:
16875 W. Bernardo Dr.
San Diego, CA 92127
(619) 451-1230

Spinnaker Software

Fast-paced adventure games are the framework this company uses in its educational software offerings for ages 3 to adult. *Math Busters*, which concentrates on the four basic arithmetic processes, and *Counting Parade*, which uses a colorful parade of animals to identify numerals and number values, are new products in the Early Learning and Learning Discovery series. *Early Learning Skills*, for the 3 to 6 age range, is more ambitious with problems in pattern recognition, shape, color and size identification; routing and planning; part-whole relationships; and problem solving. Pre-teens and teens can share *Rock 'N' Rhythm* with their parents to develop a sense of rhythm, tempo, and melody while composing, recording, and playing original music.
System: IBM PC, Apple II, C64
Address:
215 First St.
Cambridge, MA 02142
(617) 868-4700

Springboard

Users can design, produce, and print out their own newspaper complete with banners, borders, headlines, and art with *The Newsroom*, a software program designed to stimulate creativity in journalists of all ages. With a modem, text and pictures can be transmitted between previously incompatible computers, including the IBM PC, Apple II, and Commodore 64. Suggested applications range from school and club newsletters to church bulletins and business announcements. *Mask Parade* is a creative design program that allows children ages 4 to 12 to design and then print out, color, and wear masks, hats, jewelry and badges. Enhancement of fine motor skills is the object of *Rainbow Painter* for ages 4 to 10, a program which teaches color coordination and creative drawing.
Systems: IBM PC, Apple II, C64, Atari
Address:
7807 Creekridge Circle
Minneapolis, MN 55435
(612) 944-3912

Sterling Swift Publishing Company

Math Worlds: Exploring Mathematics with Computers is a 14-week, classroom-based curriculum for grades six to nine using what the authors term a capture-student, student-learn approach. This begins with the use of a symbolic language, Easy Speak, which prepares students to use algebra to express numerical ideas and provides motivation to create input/output functions based upon the control the language gives the user over the computer. Students learn to use algebra as a tool in a world where things happen only if they can express themselves using an algebra-like language to tell the computer what to do. In addition, complex formulas are related to day-to-day activities and concepts of imagination or adventure.

System: IBM PC, Apple II, C64, Pet
Address:
7901 South I-35
Austin, TX 78744
(512) 282-6840

Sunburst Communications, Inc.

Buckling up for safety is not the only object of *Make It Click: Seatbelt Safety*, a preventive health and safety program addition to Sunburst's extensive line of software designed for use in school systems. The purpose of the program is to demonstrate to students the importance of careful decision making in life-threatening situations. Beginning with background information and statistics, players are confronted with a series of incremental choices leading to a final decision as to whether or not to wear seatbelts. *The Factory* is a problem solving program that uses color graphics and animation to develop inductive thinking in students grade four and up, integrating skills in visual discrimination, spatial perception, understanding sequence, logic, and efficiency.
System: IBM PC, Apple II, C64, Atari
Address:
39 Washington Ave.
Pleasant, NY 10570
(914) 769-5030
(800) 431-6616

Tandy

The student is an explorer on a journey of learning according to Tandy's philosophy. Educational programs include both fully developed software and authoring systems which allow teachers and curriculum designers to develop microcomputer-based lessons in any subject area. The *Author I* system is a screen-oriented process which provides for both text and graphic entries in exactly the format that the instructor wants for the particular course or material. No programming experience is required to use the menu-driven format, and there is a choice between non-interactive and interactive frames. For young students, two classroom packages have been developed by the Children's Television Workshop. *Hands On* is an introductory computer literacy course with two learning modules, Blackboard and Color It. Three language arts modules develop progressive linguistic abilities in *Play with Language*, a learning manager program that allows teachers to customize lessons, assign students to different levels of play, and to save a student's work on disk. *Super Logo* continues the student as explorer theme with multiple turtles, animation, and line-editing capabilities. *Solar Exploration* offers a scenic cruise through the solar system, providing data on the planets, moons, and interstellar discoveries. In addition, many MECC software products are marketed by Tandy.
System: TRS-80, Models I and III, and Color Computer
Address:
1400 One Tandy Center
Fort Worth, TX 76102-2805
(817) 390-3832

Telarium Corp.

Popular science fiction novels have been adapted into this series of interactive educational games that features state-of-the-art graphics, original music, mouse compatibility, and full-text menus. Incorporating an advanced text parser system, the games understand a vocabulary of several hundred common English words, and come with both a hint book and a word list. In Michael Crichton's *Amazon*, players become agents for a high-tech research firm in a search for lost emeralds in the Amazon. Ray Bradbury's *Fahrenheit 451* thrusts the player into a society whose government controls the populace by destroying all literature.
System: IBM PC, Apple II and Macintosh, C64
Address:
One Kendall Sq.
Cambridge, MA 02139
(617) 494-1200

Weekly Reader Family Software

Family fun and education is the goal of this Xerox Education Publications division that is bearing the burden of educational software for children 3 to 6 years old with its Stickybear series. First appearing in *Stickybear Numbers* and *Stickybear ABC* software, the colorful, animated character was created by children's book author Richard Hefter and was designed to develop pre-school learning skills. The series was expanded with *Shapes* and *Opposites* which promote pattern recognition, reasoning skills, and understanding of basic concepts. For early grade school children, the bear introduces *Reading*, a word and sentence comprehension program with vocabulary building and instruction on subjects, objects, and verbs, and *Math*, a basic math teacher with 20 levels of difficulty that can be used simultaneously with as many as 25 children.
System: Apple II, C64
Address:
245 Long Hill Rd.
Middletown, CT 06457
(203) 347-7251

Windham Classics

Players take the role of the main character in well-known literary classics in this series of interactive adventures that teach creativity, common sense, and resourcefulness while building an appreciation of English literature. In Robert Louis Stevenson's *Treasure Island*, the player, alias Jim Hawkins, must outwit Long John Silver in the search for the gold. As Alice in Windham's adaptations of Lewis Carroll's *Alice in Wonderland* and *Through the Looking Glass*, the player encounters the March Hare, the Mad Hatter, the Queen of Hearts, the Chesire Cat, and other whimsical creatures in trying to escape Wonderland. Also published are *Below the Root*, based upon Zilpha Snyder's *Green Sky Trilogy*, and the *Swiss Family Robinson*.
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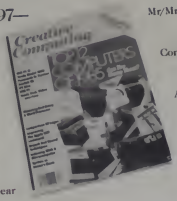

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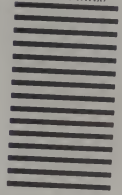

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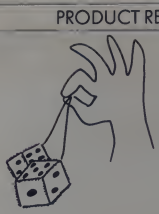

Penny Smith

There is an amazing array of arithmetic and counting programs available for pre-school and primary children. Some of the programs are extremely creative and interesting for both children and their parents. They deliver what they advertise in terms of educational goals and entertainment value. Other packages are not terribly enthralling. As a matter of fact, in many cases you could save yourself a lot of money if you just removed the furry dice from your rearview mirror and let your three-year-old count the spots.

In an effort to sort through some of the available program packages, we tested seven programs with pre-schoolers and young school-age children. Most of the programs were recommended for children in the four- to seven-year old range; two were recommended for eight- and nine-year olds. In evaluating these packages we tried to determine whether they actually accomplished their stated educational and entertainment goals. We evaluated their success in engaging and sustaining the children's interest. Finally, we looked for programs that could not only be used by the parent as a teaching tool but could also be enjoyed by the child alone.

The documentation in educational programs often includes a "Note to Parents." In the spirit of educational computing let me include the following note to adults who are looking for educational software for their young charges, relatives and otherwise. As we tested the programs, we found that the ability to deal with certain number concepts developed more slowly in some children than in others. We had to tread lightly to avoid frustrating those who were not yet able to grasp the concepts being stressed in individual games. Children's abilities also changed dramatically during the six months over which we tested the various programs. A child who was barely able to count to ten when we began using the programs is now easily able to do simple addition, subtraction, and even multiplication. Quite honestly, I can't say whether this dramatic leap forward was a result of his having worked with the programs or simply that he needed some extra time before he was ready.

The point is, don't force your child to sit in a corner and wear a dunce cap if he can't handle a particular program. If he cries when he sees Mommy boot up *ArithMagic*, just put it away and leave him alone for a while. Bring it out a few weeks or months later and see if he is ready for it. These packages are a joy to use when the child is enthusiastic about playing with them, but trying to force them on an unwilling subject doesn't prepare your child for anything but a nervous breakdown.

ArithMagic

These are three nifty little programs which can be used separately or in conjunction with one another to present a good range of basic number concepts for pre-school and primary children.

Counting

The first package, *Counting*, is geared to three- to six-year-olds and stresses counting and number recognition. The opening options screen lists two games and a stop sign which enables the child to exit the program. Game One, Introduction to Numbers, allows the child to type any number from 1 to 9. The computer will then display that number of animated objects on the screen. A question mark on the screen at the beginning of the game prompts the child to enter his choice of numbers. The proper amount of animated objects then appears on the screen. The objects then exit the screen one by one, allowing the child to count them as they go. The objects (ballerinas, balls, seals, horses) return with a large numeral to reinforce the association between the symbol and the number of objects.

The second game in this package is the Counting Game. In this game the computer goes first. It presents the objects. The child must count them and enter the correct number. The computer allows three tries to select the correct answer, after which it helps the child count the objects.

The processes of counting and associating the appropriate number with a group of objects are essential component skills for the effective mastery of number, counting, and quantity concepts. This is a program that a child can use alone or with an adult. It is definitely geared to the non-reader. Even the option screen displays a symbol for each game along with the written title. This program, as is the case with so many pre-school packages, seems to be much more attractive to the child if an adult is there to encourage him and give help when it is needed.

The Counting Game is effective when used by the child alone as well. This is a nice option since children do make discoveries on their own when they have the time to experiment and explore both right and wrong answers. It's harder to do this with an adult looking over your shoulder and knowing which key you "ought" to push.

Addition

AritnMagic Addition is aimed at four- to seven-year-olds. It takes the concept of counting presented in the preceding program one step further to include simple addition problems. In the Addition Game, the computer displays two numbers for the child to add. Each num-

Software Profile

Name: ArithMagic (Counting, Addition, Subtraction)
Author: Roger Schank
Type: Educational
Recommended Age: 3 to 6 years (Counting)
4 to 7 years (Addition)
5 to 8 years (Subtraction)
System: Apple II (48K); IBM PC
Format: Disk
Summary: Graphic critters used to illustrate and review basic arithmetic concepts
Price: $39.95
Manufacturer: Campu-Teach, Inc.
240 Bradley St.
New Haven, CT 06511
(203) 777-7738
(800) 44-TEACH

ber is both shown as a numeral and represented by a group of objects. The child must count/add both groups of numbers and enter the correct answer. If the child is correct, the answer is shown, and the two groups of objects are combined to show the correct total sum. If the incorrect number is entered, the child is allowed to try again. After three tries, the computer shows the correct answer and helps the child count the objects.

The Option Screen lists a Modifying Parameters mode in which, logically enough, you can change the parameters of the addition game to stress a particular type of problem or numerical property according to your child's needs. This option expands the application of the package and allows selective reinforcement of addition facts. It also extends the life of the package and makes it useful for a broader age range.

ArithMagic Addition is another good one. It complements and expands on the concepts presented in the *Counting* package and has the same intriguing graphics, which hold the non-reader's attention. It is not a program strictly for babies, though, and should be valuable for children in Kindergarten and primary grades for review and extra help in gaining confidence in working with numbers. This is another program which has stood the test of time. It was pulled out of the cupboard for reruns long after the initial novelty had worn off.

Subtraction

ArithMagic Subtraction completes the set. It is aimed at children from five to eight years of age. Using the techniques mentioned in the first two programs, the subtraction package features a subtraction game in which the computer presents a simple subtraction problem and then illustrates it using a box which contains the number of objects in the minuend of the problem. When the child enters the correct answer to the problem, the number of objects in the subtrahend jumps out of the box to illustrate the principle of subtraction. In the problem 7 - 2, for example, two ducks jump out of the box leaving five. The correct answer appears at the top of the screen.

I found the subtraction program to be the least effective of the series. Illustrating the problem only after the child is able to figure out the answer seems a bit backward. There may be some great educational concept in force here, but I missed it. The young children who tested the program (pre-school and Kindergarten age) found it difficult to keep track of the balloons, ducks, and horses they were supposed to be deleting from the box. The older kids were bored with puppies and kitties and seemed to want a little more action.

Summary

Roger Schank's ArithMagic series does a very good job. It begins with basic number recognition and the concept of what it means to order objects and numbered groups and progresses to counting. Then, using the concept of counting as a foundation, it presents addition and subtraction. The series is very visual and concrete. Memorization of number facts progresses naturally through repetition. There is no sense of pressure or competition; all of the games move at a very calm, even pace.

Finally, all of these programs can be used and enjoyed by a child alone or with the help of an adult. There are no fancy tricks to make them work, and the documentation is very complete, explaining all of the ins and outs of running the games and modifying the various parameters so that even a novice parent can understand them.

CIRCLE **400** ON READER SERVICE CARD

The Sweet Shoppe

I have to admit to an immediate bias against a program which displays on the front of its package a chubby green jellybean clutching a bag of popcorn (probably candy-coated), an ice cream cone, a fudgesicle, and a jar of jellybeans to its bosom. However, I will try to lay aside my brown rice and brewer's yeast mentality and give this arithmetic learning package a fair evaluation.

Mr. Jellybean is directed by a joystick to select one of three learning games in the opening screen. We can choose to count jellybeans, subtract ice cream cones or add popcorn. Let's start with the jellybeans. Mr. Jellybean spills a jar of jellybeans, and the child must count what falls out. He must then maneuver Mr. J. under the piece of candy which contains the appropriate number. If the answer is correct, a happy face is drawn on the screen in jellybeans. If it is incorrect the jellybean does a flip

Software Profile

Name: The Sweet Shop
Type: Educational
Recommended Age: 4 to 7 years
System: Apple II; C64
Format: Disk
Summary: Mr. Jellybean teaches sugar-coated arithmetic concepts
Price: $29.95
Manufacturer: Eric Software Publishing
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and encourages the child to try again.

The ice cream cone subtraction option displays three ice cream push carts, two of which contain numbers in a subtraction problem. The third cart is empty. The potential answers to the problem are displayed on fudgesicles at the top of the screen. The child directs Mr. Jellybean to the answer. If it is correct, he eats the ice cream. If it is wrong, he does a Good Humored flip and waits for further instructions. The ultimate reward for a correct answer is a great big gooey ice cream sundae. Popcorn addition operates on the same principle as the other two games.

The graphics are very well done, and Mr. Jellybean has some clever antics. Also, because the program is produced for younger children, the addition and subtraction problems are presented graphically, reinforcing the number concepts.

The package, unfortunately, is not self-correcting. If the child for some reason cannot or will not choose the correct answer, Mr. Jellybean continues doing flips until the child's next dental appointment. This can be a very sticky situation.

The documenation on this program is a little sketchy and not a little hard to find. It is cleverly concealed in a plastic pocket on the front of the box. There has to be a note inside the box which tells you where to find it. This minimal documentation is not a significant difficulty, though, because the games are simple enough for a very young child to figure out. They require no reading ability to operate well.

Note to parents: It might be a good idea to monitor the child's behavior while playing the game and be ready to wipe the saliva from his chin before it damages the keyboard.

CIRCLE **401** ON READER SERVICE CARD

Math Magic

If the ArithMagic series wins the parents' award for educational soundness, *Math Magic* wins the children's vote for "playability." *Math Magic* is essentially an arcade game with counting, addition, and subtraction practice thrown in for good measure.

The object of *Math Magic* is to defeat all the monsters by breaking down their walls before the child runs out of balls. The player scores points by bashing out individual bricks in the wall with a tennis ball. She can also score points by answering arithmetic problems which

Software Profile

Name: Math Magic
Type: Educational
Recommended Age: 4 to 9 years
System: Apple II; IBM PC
Format: Disk
Summary: Manster-filled arcade game that teaches addition and subtraction
Price: $39.99
Manufacturer: Methods and Solutions, Inc.
82 Mantvale Ave.
Stoneham, MA 02180
(617) 438-5820

appear periodically when the monster pops up from behind the wall. The ball is kept in motion by means of a paddle at the bottom of the screen. If the player misses the ball with the paddle, the ball disappears and cannot be recovered. The game is over when the player runs out of balls. The player can receive either points or presents for her efforts. The game may be set for the age of the child; the younger child automatically receives presents and the older one receives points. The ball speed increases with each successive level of play, and the paddle size decreases.

In addition to allowing the adult to modify the game play generally by the child's age, the menu offers the opportunity to customize the game according to the individual's needs and abilities.

The game is infinitely easier to play with a joystick than with the keyboard since the paddle does not respond quickly enough to keyboard control.

One criticism I would mention is that there appears to be no provision for correcting entry mistakes in answering the math problems. Once a number is entered, I could not discover a way to clear it. Therefore, the child cannot check and correct his own mistakes before the computer buzzes and provides the right answers.

Another minor matter which would be alleviated by a note in the documentation is that when the child types in a two-digit number in answer to a problem, she must type the right most digit first (as you would when doing multi-column addition or subtraction). This is fine for the more complicated problems, but it is not the way younger children are accustomed to writing numbers. Since a mistake in entry cannot be corrected, this can be quite frustrating to a child who knows the answer but can't make it come up on the screen.

Math Magic is a fun game. The children enjoyed it enormously. It is particularly valuable in that it allows a broad range of skill levels. The ball speed and paddle size can be adjusted to fit the eye-hand coordination of the child. The graphics are well done, and you can choose to reward the child with pictures of nice little presents (sailboats, horses, kittens, etc.) or gruesome creatures.

Math Magic provides a nifty bit of practice in arithmetic or counting skills. Despite the elaborate customizing features, however, this game is not a strong teaching tool. The math/counting practice occurs in a very incidental way as part of the game. This is not necessarily a defect, but it is a point to be noted in your evaluation.

Math Magic is not a calm, gentle, let's-work-on-this-together game. It is a fast and competitive game that encourages the child to outwit the monsters. The kids love it, and I can recommend it as a supplement to other more laid-back learning games. If it is treated as a game and used in concert with other math supplements, it should be a winner from both the parent's and the child's point of view. ■

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In "Growing Up Literate" we look at the SAT (again).

SAT Packages—An Update

Betsy Staples

The Scholastic Aptitude Test: the great equalizer among college-oriented people throughout the USA. I remember taking it, and you probably remember taking it. But back when I took it—and maybe when you took it—common wisdom had it that you could not prepare for the SAT, so very few people bothered to try. Your parents probably bought you a book of sample questions, and you took one or two of the sample tests. But since everyone knew that the SAT was designed to measure the effectiveness of 11 or 12 years of education, you didn't waste much time with it. "A good night's sleep the night before" was held by teachers and guidance counselors to be the best preparation.

How times have changed. Students who take the test this year can trust tutors, cram courses, and computer software to bolster their confidence and improve their scores. And lest any doubt remain as to the efficacy of these aids, George Hopmeier, an educational consultant in Milton, FL, recently found a difference of 94 points on scores between students who used the Harcourt Brace Jovanovich SAT preparation program (the only program he tested) and those who had no supplementary preparation.

The manufacturers of the four packages we discuss here all have "big names"—Digital Research; Scott, Foresman; Harcourt Brace Jovanovich; and Barron's. But as we have seen before, a big name does not guarantee a worthwhile product; sometimes it just means that a worthless product makes a louder noise when it flops.

Space does not permit a detailed description of each package, so I will begin by describing the features that the packages have in common, mention salient characteristics of each, and then list and rank the products and their features in a chart, which I hope will answer any remaining questions.

Similarities

All of the packages have extensive manuals, which offer, in addition to basic instructions for loading the programs, sample questions, tutorial material, and strategies for taking the test. All of the manuals are professionally and attractively prepared.

All of the programs are easy to load and perform reliably throughout the evaluation period. We received one defective disk, which, after a frustrating call to Digital Research's technical support staff, was cheerfully and promptly replaced by Owlcat International, developers of the program.

Because the programs are unusually data-intensive, all of them spend a great deal of time accessing the disk. The worst offender on this count is the Barron's package which spins the disk for about eight seconds between questions and at least as long when switching among menus. This package has as many "please be patient" messages as some programs have variations on the "congratulations" theme. After an hour or so of watching your disk drive wear out, you begin to lose patience with even the "please be patient" messages.

The learning mode is another common feature. At the start of a section, or

after answering a question, you can choose to have the answers to the questions explained. Most of the explanations are clear and complete—especially if you have studied the tutorial information in the manual. The one situation in which this procedure breaks down is in the Test of Standard Written English when the answer tells you that a sentence is correct as presented. This is fine if you agree that the example contains no errors. If, however, you thought something was incorrect, there is no way to find out why you were wrong.

The alternative to learning mode is test mode, in which your answers are recorded and checked just as they would be on an actual exam. At the end of the test section, whether it be an entire simulated SAT or a short practice session, your score is calculated and rendered as an SAT equivalent. Barron's offers a detailed analysis of your score, listing the various skill areas (analogies—opposites, cause and effect, etc.) and the percent of each that you answered correctly. HBJ goes a step further, assigning a study priority to each topic.

None of the programs has what I consider to be an abundance of sample questions. A limited number of questions tests each skill area, so it is possible to memorize the correct answers. This could certainly be considered a drawback. On the other hand, if you subscribe to the theory that underlies the audiolingual method of foreign language teaching, you may believe that memorizing a correct sentence is tantamount to mastering the grammatical point it illustrates—and that could be considered a benefit.

Finally, all of the packages contain mistakes. The Worst Offender Award in this category goes to the Owlcat package for lines which repeatedly "intesect" in the geometry section and the non-word "prophesizing" in the verbal drill section. All of the packages included at least one verbal question, the answer to which I was unable to accept even after a trip to the dictionary.

Now, let's look at each package briefly to find out what distinguishes each from the others.

The Perfect Score

This somewhat pretentiously titled package from Mindscape, a division of Scott, Foresman, is the least expensive of the programs we tested. Written in MicroMotion Forth-79, it is also fairly efficient in terms of disk access. In learning mode, the explanation for the previous question remains on the screen while the next question is retrieved, so there is actually something worthwhile to look at while you are waiting, and you don't feel as though you are wasting time as you do with some of the other programs.

The *Perfect Score* manual concentrates on test taking strategies rather than sample questions. It discusses the types of questions you are likely to see on the test and suggests how to handle them. It also includes short vocabulary and math review sections, the text passages for the reading comprehension questions, and the figures for the math questions.

To select an answer, you move an arrow on the screen with the arrow keys on the keyboard. This makes it difficult to select an incorrect answer by mistake and almost forces you to read all of the choices—a good habit to get into.

This package falls short in the recordkeeping department. It asks for your name at the beginning of each session, but never uses it. Nor does it record your scores on the timed test or the practice sessions; once you press the spacebar to go on, your score is but a memory. Only the score of the timed test is converted to an SAT equivalent.

Owlcat

We tested the 60-hour *Owlcat SAT Preparatory Course* from Digital Research. An abridged 15-hour course, which Owlcat says offers the same documentation but fewer disks, is also available.

Unique features of the *Owlcat* package are Buddy Study and extensive on-screen tutorial material. Each disk offers

the option of Buddy Study, a game in which two players compete by answering SAT-type questions as quickly as possible. Before you play Buddy Study, you might want to choose Manual, an option that provides an on-screen tutorial on the material tested in the Lessons and Buddy Study sections of that disk. The Manual for the math disks includes appropriate on-screen graphics. When using the verbal disks, you have the additional option of asking for help from a dictionary before answering the question in learning mode.

The documentation of the *Owlcat* package is its strong point. I found it both helpful and attractive. The tutorial material is clear, concise, and complete; examples abound, and the explanations are among the best I have seen anywhere. From a purely aesthetic standpoint, I admired the large format loose-leaf pages printed on heavy glossy stock, and as an aelurophile, I found the illustrations of cats that decorate the pages amusing.

On the negative side, I always downgrade programs that do not allow the user to change an answer before entering it. *Owlcat* gives you only one chance to type the correct letter; if your finger slips off the E and hits the D, that's too bad, your answer is recorded as D. Even the College Board lets you change your answers—as long as you remember to bring along a good eraser. And then there are those careless typos (on the disk only)—what a shame that they detract from the quality of an otherwise fine package.

A final bit of bad news concerns the Diagnostic disk, which includes a sample test and analyzes your scores. This disk can be used only once. If you want to take the test again or administer it to more than one student, you must make backup copies and use a new one for each

test. Even worse news is that you find out about this feature by trying to take the test a second time and having the program tell you "Sorry, you have already taken this test." I was unable to find even a hint of it in the documentation. The good news is that you *can* make backup copies of this and all other disks in the package.

If the documentation of the 15-hour version is truly identical to the longer version I evaluated, the shorter version is probably a better buy.

Barron's Computer SAT Study Program

Barron's has been helping high school students prepare for the SAT for decades. In fact, the copyright dates on *How to Prepare for College Entrance Examinations* stretch all the way back to 1954 (it was probably the book your parents bought you). The problem is that Barron's transition to the computer age has not been a smooth one.

The package itself, a 7.5 lb. behemoth, weighs more than some computers

—a fact attributable to the voluminous documentation. Actually, documentation is not quite the right word to describe the books that come with the program. One of them is a small User's Manual that describes the program and provides instructions for use. That is "documentation." The remaining 1300+ pages comprise Barron's *Verbal Workbook*, *Math Workbook*, and *How to Prepare*. All three are replete with sample tests, explanations, and discussions of test taking strategy. They are worth every penny of the $20.85 it would cost to buy them *sans* software in your local bookstore.

"Where, then, does the software come in," you ask. And well you might ask; I certainly did. A bit of investigation reveals that in this case the software serves primarily as an electronic answer sheet. You read the questions from the books and type in A, B, C, D, E, or P (for pass). In Question (learning mode), the computer gives you a hint and a second chance if your first answer is wrong. A brief explanation follows, whether you made a correct choice or not.

In Test mode, your sophisticated high-tech hardware displays the numbers from 1 to 25. Again, you read the questions in the book and type in the letters that correspond to the correct answers. This time, as in a real test situation, there is no feedback at all. At the end of the test, your answers are displayed again with the correct answers alongside them. If you want an explanation of a given answer, you type its number, and the explanation appears. But it is up to you to spot the wrong answers.

At the end of each sample test, the computer calculates your score and prints or displays an analysis of your skills. It is your responsibility to transfer the analysis of your score to a chart in the back of the User's Manual.

The people at Barron's have mastered the art of writing books to help students prepare for the SAT. They missed the boat entirely when they tried to apply their years of mastery to a new medium. If you like the Barron's approach, buy the books and forget the software.

Computer Preparation for the SAT

Harcourt Brace Jovanovich is a veteran in a young industry; their *Computer Preparation for the SAT* has been on the market for three years. Like Barron's, the HBJ package relies heavily on a book that was apparently not intended to be used with a computer. The book, *How to Prepare for the SAT*, is a stand-alone course complete with practice tests, tutorial material, explanations, and test taking strategies.

Again, I found both the idea and the practice of answering questions from a book on an electronic answer sheet more than a little distressing. It just doesn't seem to take full advantage of the tech-

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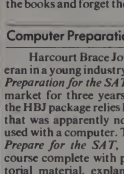

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nology, and balancing the book between various body parts and the minute amounts of empty space surrounding my computer was tedious. Several times I inadvertently skipped test questions and had to go back when I finally realized that my answers were not where they ought to have been. But, of course, that can happen on the SAT, too.

Based on your scores on the test, the computer will create for you a study plan, assigning high, medium, or low priority to the various topics for which drills are available. In the drills, you are told immediately whether your answer is right or wrong and asked whether or not you want an explanation. The math explanations are better than the verbal ones, some of which seem to stop just a bit short of providing all the information you need to understand the answer.

Responses in the drill section are almost instantaneous; there is no disk access between questions; while using *Computer Preparation*, I neither feared for the health of my disk drive nor wished I had learned to crochet in college.

The thing that struck me most forcefully about *Computer Preparation* was that its questions seemed significantly more difficult than the questions in other packages. Not having taken the SAT in many years, I cannot say which of the programs offers questions most similar to those on the test. I can say, however, that of the four reviewed here, the HBJ package offers the hardest and *Perfect Score*, the easiest questions.

Another unique feature of the HBJ package is the Vocabulary Flashcard disk, which offers 1000 items for drill and practice. A word appears on the screen and you are supposed to "look at the word and think of its definition." You then press the spacebar, and the definition appears below the word. Next, you press W or R to tell the computer whether your guess was right or wrong, so it can continue to quiz you on the ones you don't know. Again, not exactly optimum utilization of the available technology.

All things considered, HBJ seems to have eased into the computer age somewhat more smoothly than Barron's has, but the package is still a far cry from state-of-the-art. A spokeswoman for HBJ told me that an updated package, which will incorporate many of the advances in software design that have occurred during the past three years, is underway. I look forward to reviewing it for you. ■

Comparison of SAT Preparation Software

Name	The Perfect Score	Owlcat 60-hour SAT Preparatory Course	Owlcat 15-hour SAT Preparatory Course	Barron's Computer SAT Study Program	Computer Preparation for the SAT
System	Apple, IBM, C64	Apple, IBM	Apple, IBM	Apple, IBM, C64	Apple, Atari, IBM, C64 TRS-80 Models III and 4
Disks/Sides	6/12	9/9	4/4	3/6	2/4
Price	$69.95	$249.95	$89.95	$89.95	$79.95
Documentation					
Appearance	A	A	A	B	B
Tutorial Material	C	A	A	B	B
Test Taking Strategy	A	A	A	A	A
Mechanics	A	D	D	B	B
Program					
Speed	A-	C	C	F	A
Tutorial Material	A	A	A	C	B
Number of Questions	A	B	C	A	B
Recordkeeping	F	A	A	C	C
Errors	B	C	C	B	A
Overall Rating	B	B	B	C	B

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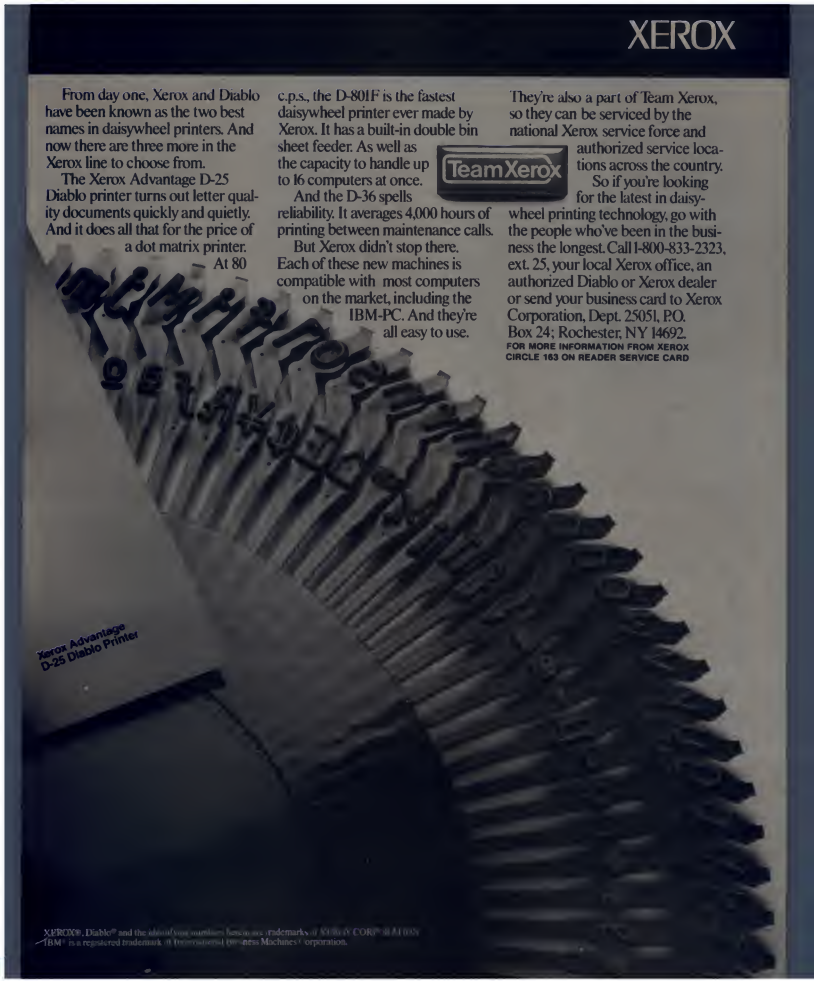

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College Explorer

David H. Ahl

Every year hundreds of thousands of high school seniors make a decision that will affect the rest of their lives: What college shall I go to? This decision is influenced by many objective and subjective factors: guidebooks, campus visits, opinions of family and friends, location, curriculum offered, and scores of others. Unfortunately, most students do not have the patience to wade through the descriptions of the nearly 3000 colleges in the U.S. to determine which ones best meet their requirements. Nor do guidance counselors who may have 100 or more students to advise.

Enter the computer. In 1973, the Educational Testing Service devised a program, SIGI, for students to use in selecting a college or career. It ran on a fairly large PDP-11 configuration; thus relatively few systems were installed, mostly in large school districts and at community colleges.

Today, however, with the increasing capacity of microcomputers, it is possible to put a college selection package such as *The College Explorer* into a much smaller machine. The program and database are still quite sizable; the Apple version, for example, requires a 64K machine.

The Apple package includes five disks. Disk I (the main program) is protected, and a backup is provided. Disks 2, 3, and 4 (data and utilities) can be copied. The program output is keyed to college descriptions in the 1800-page College Handbook, which is included with the package. Two copies of a 20-page student manual are included along with two student worksheets (schools will want to copy the worksheets). There is also a 7-page counselor manual, a sheet of technical specifications, and a warranty card (which must be returned to get annual updated editions of the databases at the reduced price of $119).

The College Explorer allows a user to develop a personal college preference profile made up of the features most important to him. The profile can be reviewed and modified until it accurately reflects his interests. The computer will then search through a list of colleges and universities to find those that match the profile.

When Disk I is loaded it asks the user's name, sex, and the date. Then a menu is presented which allows him to go to a tutorial instruction session, build a profile, review or modify the profile, reload a previous profile, or end the session. Using the program is simplicity itself. There are only two active keys: spacebar to move to various menu items and Return to choose an item.

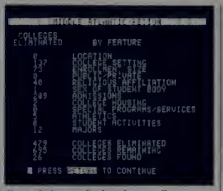

Figure 1. Screen display shows colleges eliminated by each of 12 selection factors.

Software Profile

Name: College Explorer
Type: College selection package
System: 64K Apple II, IBM PC, TRS-80 Model III and 4
Format: Disk
Summary: An excellent aid in choosing a college
Price: $189
Manufacturer: The College Board
888 Seventh Ave.
New York, NY 10106
(212) 582-6210

The College Explorer uses 12 factors that high school students frequently cite as important in selecting a college:

- Degree level (Bachelor or Associate)
- Curriculum categories (the back of the student manual lists over 400 categories and majors)
- Location (by region or state)
- College setting (from rural to large city)
- Private/Public/Religious
- Male, female, or coed
- Enrollment size
- Admissions policy (admits less than half of all applicants, more than half, or all high school graduates)
- College housing available
- Special programs (accelerated study, honors program, employment service, handicapped facilities, and many others)
- Athletics (intercollegiate or intramural for specified sports)
- Student activities (10 choices)

If the user has no preference for a particular factor, it can be skipped. Also, the instructions note that choosing just one option under certain factors, say enrollment size, can be very limiting; in those cases a range is recommended such as the option one prefers plus one smaller or larger.

After all the options have been entered, the program directs the user to insert a data disk. The package includes data on 1755 colleges offering associate's degrees and 1639 offering bachelor's degrees. The search is then initiated and, at the end of each region, a summary appears showing the number of colleges eliminated by each factor and the total number of colleges meeting all of one's criteria (see Figure 1).

At the end of the search, several options are presented: modify the profile, print (or display) the colleges found, save the profile on disk, or start over (for the next user).

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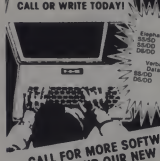

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Figure 2. Portion of output from a run of the program.

A Broadening Experience

We found it very easy to use the program; the tutorial at the beginning was scarcely necessary. The 20-page student manual is easy to understand. Like the tutorial, it is practically unnecessary except for the list of curriculum categories and majors in the Appendix.

The instruction manual states that a good goal is 20 to 30 colleges to be examined in more detail. With no prompting other than that provided by the program, one college-bound junior ran the program and came up with a list of 21 possible schools. She then changed a few factors and added some states, and the program produced 28 possibilities.

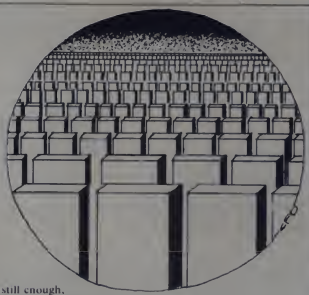
The other students who tried the program also produced workable lists and, as a whole, felt they learned a great deal by using the program. One thought the program was in error because a particular college didn't appear on his list; however, he learned to his surprise that one of his chosen options was not a feature of that college, and it was removed during the search.

In all, we felt the package was easy to learn, easy to use, and well designed to produce workable results for most users. Students enjoyed using the program, and, most important, felt the results broadened their horizons in selecting a college with a curriculum that would mesh with their interests. ■

CIRCLE **407** ON READER SERVICE CARD

Subatomic Tombstones

Peter Payack



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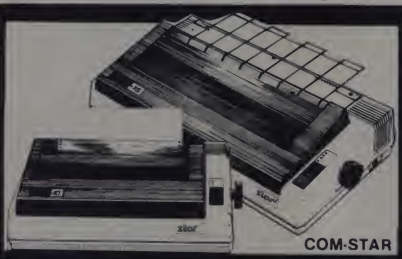

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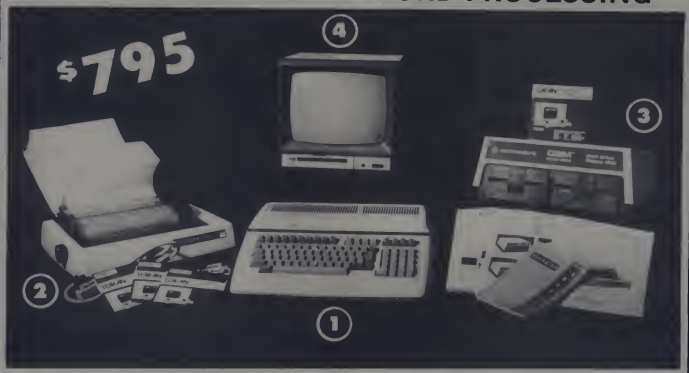

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The Fibonacci sequence revisited

More Than One Way To Skin a Rabbit

David H. Ahl

Many moons ago, we printed a letter from Konrad Kossman with a longish program for producing the Fibonacci sequence. In his letter he asked if there was a better way. I offered two alternatives, admittedly written in some haste. Readers replied with a vengeance pointing out several additional ways to generate this famous sequence. But before listing some of these gems, let us put the problem in a somewhat better historical perspective.

Leonardo Fibonacci was an Italian mathematician who lived in the late 12th and early 13th centuries. In *Liber abaci* (1202), for centuries a standard work on arithmetic and algebra, he advocated the adoption of Arabic notation. In *Practica geometriae* (1220) he organized and extended the material then known in geometry and trigonometry.

In *Liber abaci*, Fibonacci proposes an interesting problem of *the rabbits*. Suppose we put a pair of adult breeding rabbits in a cage to produce offspring and that after two months and each month thereafter they produce another pair, which, in turn, breed after two months. (This is hypothetical, of course, as rabbits do not reach maturity before four months of age.) If all the rabbits survive, how many pairs will there be at the end of any given month, or the end of one year?

The solution to the problem can be easily diagrammed—at least for the first six months or so. If you draw a rabbit diagram, you will find the number of pairs of rabbits in successive months is 1, 1, 2, 3, 5, 8, 13, 21...

Fibonacci did not explore the question of sequences more deeply, and it was not until the 19th century that Francois Edouard Anatole Lucas investigated the Fibonacci series and formally stated that each term is the sum of the two before. Thus, it invites computation by means of a computer program.

In the original article, my little three-line program to generate the series was as follows:

```
10 X=1:Y=1:PRINT 1;1;
20 Z=X+Y:PRINT Z;
30 X=Y:Y=Z:GOTO 20
```

Several readers pointed out that it is unnecessary to print out the first two elements of the series. Martin Mersky of Phoenixville, PA showed that the program could be easily amended to generate the entire sequence.

```
10 X=1
20 Z=X+Y:PRINT Z;
30 X=Y:Y=Z:GOTO 20
```

A further modification which Martin feels illustrates what is actually going on, and is also simple and elegant is as follows:

```
10 X=1
20 Y=X:X=Z
30 Z=X+Y:PRINT Z;:GOTO 20
```

Ramunas Motekaitis of College Station, TX commented that my program disturbed his sixth sense of efficient programming and asked, rhetorically, "Why code more than is absolutely necessary?" Here is his program:

```
10 Y=1
20 PRINT Y;:Z=X+Y
30 X=Y:Y=Z:GOTO 20
```

Mikko Nieminen of Finland took a somewhat different approach which calculates two new terms in each loop. Not surprisingly, all five of these programs run at exactly the same speed.

```
10 X=1:Y=1
20 PRINT X;Y;
30 X=X+Y:Y=X+Y:GOTO 20
```

All of the above approaches to calculating the Fibonacci sequence use recursion and must calculate every number in the sequence to reach a given point. However, George Miller of San Francisco and Joseph Freedman of Willow Grove, PA both mentioned a wonderful formula from linear algebra that produces any given number in the series.

$$F_n = (1/\sqrt{5})\,[((1+\sqrt{5})/2)^n - ((1-\sqrt{5})/2)^n]$$

This formula is discussed in detail in Donald E. Knuth's book, *The Art of Computer Programming, Vol. 1* (pp. 78-83). Simply stated, the closed form of a function is different from the iterative and the recursive forms in that you furnish a number, n, and the formula calculates the value for that number.

You can easily write a program with the above formula to calculate Fibonacci numbers, but it will not work! The reason is that the computer uses an approximation to calculate the value of the square root of 5. Here are two programs that use this formula to calculate any Fibonacci number, the first by George Miller and the second by Joseph Freedman. Notice the corrections for the roundoff errors.

```
10 FOR N=1 TO 20
20 PRINT INT((.5+SQR(5)*.5)^N/SQR(5)+.5);
30 NEXT N
```

```
10 FOR N=1 TO 20
20 PRINT INT(((1+SQR(5))/2)^N-
   ((1-SQR(5))/2)^N)/SQR(5)+.5);
30 NEXT N
```

To generate an entire sequence of numbers, the formula method is considerably slower than the recursive approach; however, to generate just one number, particularly a high order one, the formula is certainly preferred. Miller's program, incidentally, is somewhat faster than Freedman's.

To Mr. Fibonacci go our thanks for his rabbit problem; and to our readers, thanks for helping skin it in a variety of interesting ways! ■

Wondrous Numbers And Other Diversions

W. Lloyd Milligan

Tortoise: *Let me. . . show you a property which is very easy to define, and yet for which no terminating test is known. I'm not saying there won't ever be one discovered, mind you—just that none is known. You begin with a number—would you care to pick one?*

Just a few pages before the *end* of Douglas Hofstadter's marvelous book, *Gödel, Escher, Bach: An Eternal Braid*, the Tortoise tells Achilles about "wondrous" numbers.

Begin with any whole number. If it is odd, multiply it by 3 and add 1. If it is even, divide it by 2. Continue in the same way with the resulting number. If applying this process repeatedly eventually brings you to 1, then the number you started with is a wondrous number.

The curious thing about the wondrous property is that you can never be sure (by applying this algorithm) that a number is *not* wondrous.

The Tortoise leaves Achilles a puzzle:

Tortoise: *Why don't you try starting with 27? Mind you, I don't promise anything. But sometime, just try it, for your amusement. And I'd advise you to bring along a rather large sheet of paper.*

Perhaps one sort of "rather large sheet of paper" is the personal computer. And who having such a sheet of paper in hand could resist the Tortoise's challenge?

You first need a number, so

10 INPUT N

If it is odd, multiply it by 3 and add 1.

20 IF N/2 <> INT(N/2) THEN N = N*3 + 1

If it is even, divide it by 2.

30 IF N/2 = INT(N/2) THEN N = N/2

If you have reached 1, then stop and declare the number to be wondrous.

40 IF N = 1 THEN STOP

If not, repeat the entire process.

50 GOTO 20

This five-step program works as intended; however, the reader is cautioned that on some trips through the loop the value of n changes twice!

It would be interesting to count how many iterations of the wondrous process are required to make a number wondrous, and, in particular, to make 27 wondrous. To this end we sharpen and decorate our program a bit (see Listing 1). You will want to verify this for yourself, but when I asked my program whether 27 was wondrous, it told me that 27 is a *wonwon-wondrous* number.

Primes and Polynomials

Martin Gardner offers the following problem. Starting with the prime number 41, add 2 to get another prime 43. Then add 4 to get 47. 47 + 6 is 53 and 53 + 8 is 61. So far there have been nothing but primes. Does this procedure always yield primes?

To answer this question, we procure a rather large sheet of paper, and proceed to write a small program (see Listing 2). We may be satisfied on the first run to examine 10,000 terms of the sequence, or else be prepared to wait a while.

As it happens we won't have to wait long. Because the forty-first term in the sequence turns out to be composite. But!—wasn't 41 the number we started with? Is this some kind of coincidence?

Actually not. Let's look at another way of characterizing the sequence. The kth term is given by

(1) $k^2 + k + 41$

This is easy to see, if you recall that the sum of the first k positive integers is $k*(k+1)/2$. The first k even numbers

$$\left(\sum_{i=1}^{k} 2*i\right)$$

Listing 1. Program to test if a number has the wondrous property.

```
10 PRINT "WONDROUS NUMBER TESTER"
20 INPUT "ENTER NUMBER TO BE TESTED";N
30 M=N
40 I=0
50 IF M<>1 THEN 80
60 PRINT I;" ITERATIONS ARE NEEDED TO
   MAKE";N;"WONDROUS."
70 GOTO 20
80 IF M/2=INT (M/2) THEN 110
90 I=I+1
100 M=M*3+1
110 I=I+1
120 M=M/2
130 GOTO 50
140 END
```

is twice the sum of the first k positive numbers $(2\sum_{i=1}^{k} i)$.

Clearly, if we set k = 41, expression (1) factors as 41•(41+1+1).

Indeed for any prime p,

(2) $k^2 + k + p$

is divisible by p whenever k = p. This result is trivial, but it points in the direction of a less trivial one. You might imagine that some sufficiently complex polynomial

(3) $a_0 + a_1k + a_2k^2 + \ldots + a_nk^n$

is a formula for prime numbers. That this cannot be so was first shown by the Swiss mathematician Leonhard Euler (1707-1783). See note [1].

The *sufficiently assiduous* reader (Hofstadter's term) has probably noticed that the key to the method of Listing 2 is that $k^2 + k + c$ differs from $(k-1)^2 + (k-1) + c$ by exactly 2•k. There is a more general method of evaluating polynomials which is of interest. Expression (3) can be re-written as follows:

(4) $k•(\ldots k•(k•(a_nk + a_{n-1}) + a_{n-2}) + \ldots + a_1) + a_0$

I first learned of this method of evaluating polynomials from the Hewlett-Packard HP-55 mathematics program handbook. This numerical method works especially well with H-P's stack-oriented "reverse Polish notation" pocket calculators, but is useful in a variety of applications.

A fairly easy programming exercise is to write a routine for evaluating a polynomial, given an ordered n + 1 tuple of coefficients and some fixed value x as input. Such a routine can be used, for example, to compute the sum of the first n *k*th powers using commonly available formulas.

Counting Things

The first mathematical thing that most of us learn to do is count. This is as far as many people ever get. For this reason, mathematicians have set aside a special branch of their field called "combinatorial analysis." Ironically some of the most difficult mathematical problems involve counting—it is from the counting difficulty, for example, that many finite probability problems inherit their treachery.

Helpful formulas to assist with counting things abound. For example, the number of distinct subsets of a finite collection of n objects is 2^n. To prove this, imagine that each object is labelled 1, 2, . . . , n. We associate with each subset a binary number using the following rule of correspondence: If the object labelled k is a member of the subset, then the *k*th digit of the binary number is 1; otherwise it is 0. Clearly, there are exactly 2^n such distinct binary numbers, and therefore 2^n subsets.

The number of subsets of size k in a collection of n objects (k ≤ n) is

(5) n!/k!(n-k)!

Expression (5) is called the combinations formula because it stands for the number of combinations of n things taken k at a time. It is also equivalent to the coefficient of the *k*th term in the expansion of the binomial $(a+b)^n$. The binomial coefficient is usually written $\binom{n}{k}$. Since the total number of subsets in a set of size n must equal the sum of all subsets of size k for each k = 0, 1, . . . , n; we have

(6) $\sum_{k=0}^{n} \binom{n}{k} = 2^n$

Can you think of a simple direct proof of expression (6)? (See note [2].)

Unfortunately, not every counting problem is easily reduced to a simple formula as in the preceding examples. For some problems, however, it is possible to exhibit counting algorithms. Several such Fortran programming examples, some quite technical, are given in the book *Combinatorial Algorithms* by Albert Nijenhuis and Herbert Wilf.

Counting Ties at Pool

The game of pool is usually played with 15 balls numbered 1 to 15. For present purposes, assume that there are two players.

One variant, called "rotation," is scored by adding the values of all the balls pocketed by each player. To win this game a player must score 61 or more points. Sixty points to each player constitutes a tie-game. In general, ties are possible if and only if the total number of balls is 4•k or 4•k-1, where k = 1, 2, 3, . . .

It is apparent that the number of distinct ways in which rotation can be tied is even. For any particular tie-distribution of balls, exchanging the identity of the players yields a complementary tie-game.

Another way of expressing this symmetry principle is to say that for any particular ball, the number of tie-distributions in which the ball belongs to one player is equal to the number of ties in which the ball was scored by the other player.

When I first thought of the problem of counting ties at pool (rotation), I hoped that the symmetry concept would generalize very quickly to a formula for ties whose argument is the number of balls. If such a formula exists, however, I have not been able to find it.

To get an idea of how to design an algorithm for counting ties, it is helpful to consider how you would enumerate tie-distributions exhaustively using pencil and paper. The task is to be sufficiently systematic as to ensure against repetition and, at the same time, to permit no accidental omissions. With the 15-ball pool game this is surprisingly difficult.

However, with a smaller number the task is accomplished more easily. Table 1 enumerates all tie-distributions which include the 8-ball in a hypothetical game played with eight balls. (Let's call this the order-8 game.) A tie-score is obtained in the order-8 game when each player scores exactly 18 points.

Seven distributions are shown in the table. Taken together with the seven complementary distributions, there are 14 ways to tie in all.

Listing 2. This program searches for the smallest composite number in the sequence 43, 47, 53, . . . Other sequences c + 2, c + 2 + 4, c + 2 + 4 + 6, . . . may be examined by changing the assignment at line 10.

```
10 C=41
20 FOR N=2 TO 20000 STEP 2
30 C=C+N
40 GOSUB 100
50 IF P=1 THEN GOTO 80
60 PRINT C-N;"+";N;"IS DIVISIBLE BY "I@
70 STOP
80 NEXT N
100 P=0
110 Z-SQR(C)
120 FOR @=3 TO Z STEP 2
130 X=C/@
140 IF X=INT(X) THEN RETURN
150 NEXT @
160 P=1
170 RETURN
180 END
```

There is a pattern in Table 1, but it is somewhat difficult to describe. Moreover, care is essential if the description is to form the basis of a general algorithm.

Listing 3 presents a program for counting ties in the order-n game. The actual counting part of this program is contained in the 12 lines numbered 70 through 180. The algorithm is based on the pattern in Table 1. Before studying Listing 3 you may wish to design your own counting program.

Table 1.

Ties at order-8 pool (rotation) which include the 8-ball.
8 7 3
8 7 2 1
8 6 4
8 6 3 1
8 5 4 1
8 5 3 2
8 4 3 2 1

Listing 3. Program to count ties at order-n pool (rotation). Variable C is the tie counter; N stands for the number of balls; I is the tie score value; S is the sum of balls pocketed in the current try. The array X contains the values of individual balls.

```
5 C=0
10 PRINT
20 INPUT "ENTER NUMBER OF BALLS";N
30 T=(N*N+N)/4
40 IF T<>INT(T) THEN GOTO 220
50 DIM X(N)
60 IF T<>N THEN GOTO 70
64 PRINT "TRIVIAL CASE...THERE ARE 2
    TIES"
66 STOP
70 X(1)=N
80 FOR I=2 TO N
90 X(I)=X(I-1)
100 X(I)=X(I)-1
110 IF X(2)<1 THEN GOTO 200
120 IF X(I)>=1 THEN GOTO 150
130 I=I-1
140 GOTO 100
150 GOSUB 250
160 IF S=T THEN GOSUB 300
170 IF S>=T THEN GOTO 100
180 NEXT I
200 PRINT "TOTAL POSSIBLE TIE SCORES
    =";I;"C
210 STOP
220 PRINT "ERROR: NUMBER OF BALLS MUST ="
230 PRINT "4*K OR 4*K-1, K AN INTEGER."
240 GOTO 10
250 S=0
260 FOR J=1 TO I
270 S=S+X(J)
280 NEXT J
290 RETURN
300 C=C+1
305 PRINT
310 FOR J=1 TO I
320 PRINT X(J);
330 NEXT J
340 RETURN
350 END
```

The value of a tie score in the order-n game is computed at line 30. While line 40 tests to see that a tie game is indeed possible.

It is evident that in an order-n game, neither player can pocket more than n balls. So at line 50 we dimension an array to contain values of the balls pocketed in tie trys including the n-ball (see line 70). There is one trivial case ($n=3$) in which the value of a tie score is equal to n. This case is disposed of at line 60.

As was shown in the preceding section there are 2^n subsets of a set of n elements. Thus there are 2^n total different games of order-n rotation neglecting the order in which balls are pocketed by the players. For the usual order-15 game this is the familiar number 32,768.

As in Table 1, the program uses the principle that the number of ties with the n-ball equals the number of ties without it. Line 70 pockets the n-ball.

The counting loop structure is somewhat complicated because the index variable is altered within the loop as well as by the NEXT statement. The value of I denotes the number of balls pocketed in the current try for a tie-distribution.

To understand how the counting algorithm works, it is helpful to trace the execution of the program for at least one row of the 8-ball problem. Unfortunately this analysis is too detailed to include here.

On first entering the FOR loop, the n-1 ball is pocketed. The value of each pocketed ball is set up experimentally at line 100. The loop (and program) terminating test is performed at line 110.

Whenever the last ball pocketed has an invalid value (<1), "unpocket" it and decrement the value of the previous ball (lines 120-130). When the last ball is valid, line 150 transfers control to a subroutine (line 250) which computes the score for each try.

If a tie is found (line 160), the subroutine at line 300 increments the tie counter and prints the distribution. Printing distributions greatly enhances the interest of the program. Finally, line 170 decides whether to decrement the value of the current ball or to pocket another ball for the next try.

Summary

This article has described three recreational programming problems. Recreational problems are helpful in developing analytical and programming skills. Their real appeal, though, is in their capacity for discovery. I have tried to share the sense of enjoyment one experiences on finding something unexpected or curious. Who knows whether the next problem may lead to a truly interesting finding?

Footnotes

[1] Obviously, not every polynomial P is divisible by its constant term. But, if N is an integer such that $P(N) = M$, then it is easily shown that for any integer k, M divides $P(N + k \cdot M)$. Since P cannot assume any given value more than n times, where n is the degree of P, there is sure to be a value of $P(N + k \cdot M)$ distinct from $\pm M$ for some choice of k.

[2] Since $\binom{n}{k}$ is the binomial coefficient,

$$\sum_{k=1}^{n} \binom{n}{k} = (1+1)^n = 2^n.$$

■

NOTEBOOK COMPUTING

Selecting a notebook portable computer under $1000

David H. Ahl

Now that the big three in notebook portables (Tandy, NEC, and Epson) have all released their second generation of machines, perhaps it is time to take a look at just what you can get for $1000 or less. The way we see it, there are five serious contenders: the Tandy Models 100 and 200, NEC PC-8201 and 8401 Starlet, and Epson PX-8 Geneva. Unfortunately, none of them emerges as a clear winner.

As in selecting any kind of computer, it is important to start out by defining exactly what you intend to do with the machine today, and what you think you might like to do with it in the future. Then, a table of specifications starts to take on real meaning as you compare it against your requirements.

As we look at the five major contenders in the under $1000 range, we cannot put ourselves in your place. Instead, we'll try to identify the strong and weak points of each machine and let you draw your own conclusions.

Common Characteristics

All five machines use a CMOS equivalent of the old workhorse Z80A microprocessor. All of them have full-stroke keyboards with at least 56 keys. All have three or four fixed function keys and eight to ten programmable ones. All of the machines are virtually the same size and are truly portable with weights ranging from 3.8 to 5.0 lbs. All have an RS-232 port and connection for an external cassette recorder. All of them have built-in word processing software (of quite different capabilities) and telecommunications software.

An optional floppy disk unit is available for all of the machines; the Epson and NEC units are 3 1/2" battery operated units, while the Tandy unit is 5 1/4" and AC operated. A 3 1/2" battery operated unit is available for the Tandy computers from Holmes Computer Products.

Four of the five computers have a parallel port, bar code reader port, built-in 300 baud modem, and Microsoft Basic. Also, an optional CRT adapter is available for four of the five machines.

Enough of the similarities; what are the differences?

NEC PC-8401 Starlet

This machine has the largest display of the group (16 lines x 80 characters). It also has the most ROM (96K) and ties with the Epson for maximum RAM (64K). The ROM contains the operating system (CP/M 2.2) plus full-featured word processing, spreadsheet, and telecommunications software. Another plus for the Starlet is the availability of external plug-in 32K memory cartridges.

Unfortunately, no notebook computer under $1000 emerges as a clear winner.

The most glaring weakness of the 8401 is the absence of a programming language; not only is Basic not built in, but no language is available for the computer. *Personal Filer* is the best database package of any of these machines. However, it is still not particularly versatile.

If you need a full-featured word processor and spreadsheet with lots of room for files, and don't want to do any programming, the 8401 is probably the best of the lot.

Epson PX-8 Geneva

The Geneva has the best keyboard of the group with some thoughtful touches such as LEDs to indicate caps lock, numeric keypad, and insert mode. Its 32K of ROM contains CP/M 2.2 but unfortunately the applications software is on plug-in ROM packs, only two of which can reside in the machine at the same time. The most popular four ROM packs are Basic, *Portable WordStar, Portable Calc* (including *Portable Scheduler*), and CP/M Utilities.

Alone in the group, the Geneva has a built-in microcassette recorder which makes up for its inability to store more than five files in memory. For additional storage, Epson also offers a clamp-on RAM pack (64K or 128K) and a 3 1/2" battery-operated floppy disk drive. The Geneva has built-in rechargeable batteries which have the longest life of any of the five machines.

Weak points include the lack of a parallel port (means you must have a serial printer), lack of a standard RS-232 connector, and non-availability of a CRT adapter. Also, we found that CP/M on the Geneva was not quite as user-friendly as it is on the Starlet.

If most of your work is with two applications (so you don't have to change ROM packs constantly), if you need built-in mass storage (microcassette), and if you need to go a long time between AC outlets, the Geneva is probably your best choice.

Tandy Model 200

Like the Geneva, the Model 200 has a mid-size display, but it is arranged differently (16 lines x 40 characters) and is physically larger than the one on the Geneva. The Model 200 is basically an enhanced Model 100, the major differences being a larger display, more memory, better arrangement of cursor control keys, and built-in spreadsheet software (*Multiplan*).

Text, the word processing software package, does not have the many features of *WordStar* (on the 8401 and PX-8), but it is considerably easier to use. Also, the lack of the CP/M operating system (or any operating system for that

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matter) means the machine is more approachable and more forgiving—a boon to klutzy users like me.

In general, with its considerably less powerful and versatile software than that on the 8401 and PX-8, the Model 200 seems more like a 1 1/2 generation effort. Nevertheless, if you need a good spreadsheet, Basic, and an occasional word processor in a very forgiving machine, the Model 200 would be your best choice.

Tandy Model 100

With all the second generation machines, why would you look at a Model 100? One reason: price. When the dust settles, you have to ask yourself, are a twice-as-large display, spreadsheet software, and decent cursor keys worth over $400? After all, you can beef up the Model 100 with third party add-on memory (PG Design, Purple Computing, etc.) and an excellent spreadsheet on ROM (*Lucid* from Portable Computer Support Group). Furthermore, there are several other RAM-resident spreadsheets available for the Model 100.

With all the second generation machines, why would you look at a Model 100?

Buy a Model 100 at a discount, some add-on memory and additional software, and the only thing your extra $300-400 for the Model 200 gets you is eight more lines on the display and a diamond-shaped cursor key cluster. Is it worth it? Only you can decide.

Comparison of Notebook Portable

	Epson PX-8 Geneva	NEC PC-8401A Starlet
Size	8.5" x 11.5" x 1.8"	8.5" x 11.75" x 2.2"
Weight	5.0 lbs.	4.7 lbs.
Display: text resolution	8 lines x 80 chars	16 lines x 80 chars
Graphics resolution	64 x 480 pixels	128 x 480 pixels
Keyboard	63 keys (LED for caps lock, numeric, insert mode)	66 keys 7 function keys
Single keystroke functions	4 fixed, 10 programmable	3 fixed, 10 programmable
CPU	Z80 (CMOS equiv.)	Z80 (CMOS equiv.)
RAM	64K	64K
Max. files in memory	5	24
ROM	32K	96K (3 x 32K)
External RAM	64K ($329) or 128K ($460)	32K cartridge
External ROM	32K cartridges	No
RS-232 port	Yes	Yes
Parallel port	No	Yes
Other ports	Serial, cassette, bar code, system bus	Cassette, voice phone, direct modem, system bus
Built-in mass storage	Microcassette	None
Floppy disk (optional)	3½" battery opn ($599)	3½" battery opn ($599)
Word processing	Portable WordStar	WordStar-To-Go
Spreadsheet	Portable Calc	Calc-To-Go
Database manager	None	Personal Filer
Telecommunications	TERM	Telcom
Other software	Portable Scheduler	None
Operating system	CP/M2.2	CP/M 2.2
Programming	Microsoft Basic	None
Modem (built in)	300 baud	300 baud
Modem (optional)	1200 baud direct connect Acoustic coupler	1200 baud direct connect
CRT adapter	Na	Optional ($249)
Battery life	15 hours	8 hours
Suggested retail price	$995	$999

NEC PC-8401 Starlet

Epson PX-8 Geneva

Tandy Model 200

Computers Under $1000

Tandy Model 200	Tandy Model 100	NEC PC-8201
8.5" x 11.75" x 2.2"	8.5" x 11.7" x 2.0"	8.5" x 11.8" x 2.4"
4.5 lbs.	3.8 lbs.	3.8 lbs.
16 lines x 40 chars	8 lines x 40 chars	8 lines x 40 chars
128 x 240 pixels	64 x 240 pixels	64 x 240 pixels
56 keys 12 function keys	56 keys 12 function keys	58 keys 6 function keys
4 fixed, 8 programmoble	4 fixed, 8 programmoble	3 fixed, 10 programmoble
Z80 (CMOS equiv.)	Z80 (CMOS equiv.)	Z80 (CMOS equiv.)
24K	8K (32K max.)	16K (64K max.)
46	19	21 per bonk
72K	32K	32K
72K	32K (third porty)	32K cortridge
104K	32K (third party)	No
Yes	Yes	Yes
Yes	Yes	Yes
Cossette, voice phone, bor code, system bus	Cossette, bar code, system bus	Cossette, bar code, system bus
None	None	None
5¼" AC operotion	5¼" AC operation	3½" battery opn ($799)
Text	Text	Text
Multiplon	No	None
Address orgonizer	Address orgonizer	None
Telcom	Telcom	Telcom
Scheduler	Scheduler	None
None	None	None
Microsoft Basic	Microsoft Basic	Microsoft Basic
300 baud	300 baud	No
None	None	300 baud ocoustic or direct connect
Optionol	Optionol	Optionol
16 hours	8-10 hours	8-10 hours
$999	$599	$499

NEC PC-8201

If you think a Model 100 might meet your needs, then so might an 8201. The main difference between the two machines is that the Model 100 has a built-in modem whereas the 8201 has better cursor control keys (the same as the Model 200), better Basic program editing, and, optionally, more built-in and external memory. NEC also sells a portable 3 1/2" battery (or AC) operated disk drive.

PC-8201s are being sold today at substantial discounts. A deeply discounted 8201 coupled with a NEC disk drive or SideCar memory pack (up to 128K) from Purple Computing makes an attractive alternative to one of the three new units at about the same price. If you're satisfied with the limited software and display, but looking for more memory, this is probably the way to go. ■

Firms Mentioned in This Column

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5175 Greenpine Dr.
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Tandy Model 100

NEC PC-8201

"Do you have a lap computer that will fit this lap?"

APPLE CART

More on the Scribe, a programming contest, and Apple snuggles up to IBM

Owen Linzmayer

Happy Birthday Apple IIc! Has it really been a year since you made your debut at the Moscone Center in San Francisco? My how you have grown. This month we take a look back at your first year—at the excitement and disappointment—and attempt to see what the future holds for the youngest member of the Apple family. We also have a follow-up on the Scribe printer, the Great Apple Programming Contest (win free software!), and a brief look at some Apple products that will change the way "the rest of us" do business. Hi ho, hi ho, it's off to work we go.

IIc—Year One

In a great execution of "event marketing," Apple introduced the IIc to an enthusiastic audience at San Francisco's Moscone Center—you remember, the site of the Democratic national convention. Apple claims it took orders for over 50,000 IIc computers that very day. Following the warm reception of the Mac, it initially looked as if Apple had another blockbuster product on their hands, and President Sculley predicted that Apple would sell half a million units by year-end. Maybe John spoke too soon.

The Apple IIc, though a perfectly capable machine (and a sexy one at that), was immediately criticized by trade publications for its lack of slots. I am perfectly aware of the fact that the Apple IIc contains the "most popular" peripherals already installed in virtual slots, but along with many third-party hardware manufacturers, I lament that Apple didn't provide external access to at least one expansion slot. Has this been the case, I think Sculley might have realized his 500,000 sales expectations.

Heralded as a portable computer, as of this writing the IIc has yet to get its traveling papers in the form of a full-screen LCD and battery pack. Back in April of last year Apple showed off a full-screen liquid crystal display that would connect to the IIc via the video expansion port. This flat-panel screen is capable of displaying 80 columns by 24 lines of text and even double hi-res animated graphics. Initially this product was slated for release in the fourth-quarter of 1984, but Cupertino continued to push back the release date. Latest word has it that the LCD flat-panel display will be in stores by the time you read this.

As of this writing the IIc has yet to get its traveling papers in the form of a full-screen LCD and battery pack.

But when you think about it, how many people will be willing to part with several hundred dollars just so they can lug around a "portable" IIc? I put the word portable in quotes because there is still no official word on the official battery pack that is necessary for the IIc to take to the roads and skyways (Discwasher offers a carrying case with built-in power supply).

Enough of unfulfilled hardware promises, what about all that great software that was going to take advantage of the built-in mouse technology? Well, to be honest, with the exception of a few programs such as Odesta's *How about a Nice Game of Chess*, the mouse-icon user interface for the II line just hasn't caught on. Not yet at least. If Apple had bundled a mouse into the IIc package, software houses would have flocked to support it.

There is still a chance that the mouse-icon user interface will become as widely accepted for the II line as it has on the Mac, but such acceptance hinges on a recently available IIe ROM upgrade offered by Apple. Four chips are involved, the most important of which is the 65C02, the cpu used in the IIc.

Basically the 65C02 is a low-power chip compatible with the 6502 (used in the rest of the II line), the main difference between the two being that the 65C02 contains special codes that optimize the programmability of the mouse as an input device. This upgrade ensures the compatibility of IIc software for use on the IIe. If enough IIe owners purchase the upgrade I would expect software manufacturers to begin a full-fledged effort to support the mouse-icon interface on the II family.

I'm going to end my diatribe on IIc deficiencies without even mentioning the slow serial port problem (see December 1984 Apple Cart). Let me say for the record that I own a IIc, and though sometimes I seem critical, I don't regret my purchase. I can think of no other computer for the price that is so attractive and operates with such beautiful simplicity.

Scribe Errata

I reviewed the Apple Scribe thermal printer in this column in December of 1984, at which time I recommended that potential buyers save their money and purchase the Apple Imagewriter instead. This recommendation was due largely to inadequacies of the thermal transfer process employed by the Scribe to print text and graphics. I found the output highly inconsistent and not up to Apple's standard of quality. Recently I received a letter from Linda Merrill of the Apple II Public Relations Office which prompted me to drag the Scribe out of the closet and take a second look. The letter was printed with a Scribe and reads as follows:

"I am responding to the Apple Scribe printer review article which appeared in your December issue.

"The print quality of the Apple Scribe printer, like all thermal transfer

printers, is directly affected by the smoothness of the paper used. It is the paper that unlocks the true potential of the Scribe. By using a smooth surfaced paper, the Scribe has the capability to produce print quality that was never before available in a printer of Scribe's price class. The article did not specify the type of paper used in testing; we recommend Hammermill Thermal Transfer Paper.

"Ribbon prices are quite different from those indicated in *Creative Computing's* article. Black ribbons have been available since August at $4.99 (not $6.99). Color ribbons are now priced at $5.99 and were never sold at $9.99. We would appreciate it if you would provide this information to your readers."

Thanks for the letter Linda, I always appreciate fan mail. When I reviewed the Scribe I specifically stated that "Apple recommends any 16 to 20 pound smooth finish stock or Xerox 4024 copier paper." For my test purposes, I used the Xerox paper as it gave me the best print quality of all the papers I tried. I have since tracked down a ream of Hammermill paper and must admit that the print quality is greatly improved with this paper.

Even in light of what you have brought to my attention, Linda, I must still recommend the Imagewriter in lieu of the Scribe for several reasons. First of all, Hammermill Thermal Transfer paper is expensive, and the people that opt to buy the Scribe do so because it is an inexpensive way to get hardcopy—they shouldn't be burdened with the cost of special paper. Second, the Scribe ribbons are also relatively expensive, and are consumed far too quickly to make them economical; the low price of the Scribe is offset by the high cost of ribbons and paper. But the Scribe is not alone—none of the thermal transfer printers I have seen to date offers what I consider adequate print quality for the money.

Write Away!!!

Ok, you've asked for it, so here it is. The Great Apple Programming Contest. Many readers have been complaining about the high price of commercial software, so here it is, a programming contest that will add to the body of public domain software. And there are prizes, too. Sound good? Read on for details.

To enter the contest, simply mail us your favorite piece of code in any language for any Apple computer in machine-readable format (program listings not acceptable, unless under 10 lines). If you have a CompuServe account, feel free to upload your submissions directly to the Apple Cart section in the Creative Computing SIG (go pcs-22 from any function prompt). Incidentally, the best of the runners-up will be posted on CompuServe for easy downloading. The winners (especially those of short to medium length) will stand a good chance of being published in the magazine.

There will be software prizes in each of the following categories: graphics, utility, entertainment, nonsense, best overall, and best short program. The Mac, the II, and the III will have their own sets of winners, so there are plenty of chances to win.

Please include with your submission a short description of what the program does, what computer it runs on (list all requirements), a program listing, your address and phone number, and what type of software package you prefer if you win. The contest ends May 15, 1985. Winners will be notified within one month of that date. All submissions become the property of *Creative Computing*. The contest is open to all readers, except employees of Ziff-Davis Publishing Company. There you have it—a most generous offer if I do say so myself. What are you waiting for? Power up your system and get those disk drives spinning, you've got a contest to win.

Working in the Mac Office

At its annual shareholder's meeting on January 23, Apple announced several new products that make the Macintosh a viable contender in the fight to keep IBM from maintaining its stranglehold in the business computer market. Although a more in-depth evaluation will appear in a subsequent issue, a brief overview of these products is in order now.

The Macintosh Office is centered around AppleLink, a local area network that will support as many as 32 computers or peripheral devices, including other AppleLink networks. The cost for each node of the network is $50, compared to $300 to $1000 for connections in other similar networks. The Mac Office allows workers to share information and greatly improves communications and productivity in the work environment.

Probably the most important thing to note is that the AppleLink can connect not only Macs, but IBM personal computers as well. Imagine that; it's akin to the U.S. allowing the Soviet Union to borrow the keys to the space shuttle. Actually, it is a brilliant move by Apple. You see, there are so many IBM PCs entrenched in the corporate world that managers are hesitant to buy Macintosh computers. By ensuring that with AppleLink the Mac can communicate with IBM computers, Apple just may infiltrate the coveted business market now dominated by IBM.

Two other very important announcements made at the shareholder's meeting were the introduction of a laser printer, named LaserWriter, and the reduction in price of the Mac line of computers. The LaserWriter can produce near typeset-quality text and high-resolution graphics all at a maximum rate of eight pages per minute. The out-

The LaserWriter Printer

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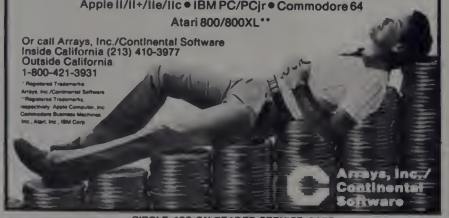

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put of the LaserWriter must be seen to be believed. Also, since it can emulate the Diablo 630 daisywheel printer, the LaserWriter can be used by IBM-compatible personal computers.

In addition to renaming the Lisa 2/10 computer the Macintosh XL, Apple announced that it was reducing the price of the machine to $3995. The Fat Mac has also been reduced from $3195 to $2795. Also note that the price of the 128K to 512K upgrade has been slashed several hundred dollars, bringing it down to $700.

By ensuring that with AppleLink the Mac can communicate with IBM computers, Apple just may infiltrate the coveted business market now dominated by IBM.

If that is still out of your reach, you may want to contact Centra Systems Inc. of Agoura Hills, CA. They provide a functionally and electronically equivalent upgrade for $350 plus shipping. Their work includes a 90-day warranty and is certainly worth looking into if you can afford to be without your Mac for a week or two while the upgrade is being performed. ■

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TANDY GRAM

Third-party DOSes make Color Computer programming easier

Jake Commander

The following was sent to me from Spectrum Projects in San Jose, CA. In true cloak-and-dagger style, there was no accompanying letter, so I'm assuming the sender is using me as a forum. It concerns a new version of the Color Computer and is reprinted exactly as I received it.

"Speaking of newer and newer versions of CoCo II: The very latest is 26-3136A and it has a totally revised board. Once again, Tandy has pulled the rug out from under third-party suppliers. For instance, non-standard Texas Instruments RAM chips are installed. The 16K computer uses TMS4416 chips which are 18-pin 4x16's, so only two sockets are required, not the eight sockets that we are accustomed to. Because these chips require a 256 (versus a 128) cycle refresh, a new SAM chip is required—a 74LS785. (The previous one was a 74LS783.)

"The VDG (video display generator) is the same, but a new one with true lower case will be in the 26-3136B version of CoCo II and CoCo III. A new 28-pin ROM (the old version was 24-pin) is used for Color Basic and Extended Color Basic (yes, one chip for both Basics). Basic is now version 1.3 and is soldered in rather than socketed. If a non-extended 16K computer is made with this board, it will be supplied with a 24-pin Basic chip plugged into a 28-pin socket, or maybe soldered into the location. There are 12-pin connectors near the RAM chips and some jumpers marked '128K RAM' so we can expect some kind of a satellite board next year for that upgrade. (The 64K upgrade may be via satellite board as well.) The 74LS244 buffer has been changed to a 74LS623.

"Finally, the disk controller has been completely redesigned. The part number (AX7980) is the same but there are fewer chips used. They are: a new Western Digital 1773, which is a 28-pin floppy disk controller chip, and seven others (74LS74, 74LS14, 74LS139, 74LS02, 74LS273, and two 74LS16s). The new controller clock speed is 16 MHz rather than 10 MHz."

Thanks to Spectrum Projects for that information. It shows how difficult it can be for independent third-party suppliers to keep abreast of Tandy's intentions at the hardware level. The Color Computer continues to be rejuvenated —maybe Tandy hopes that it will become their Apple II.

Motorola has had a chip set available for some time which allows a high-resolution display with 64 different colors. For a while rumors abounded that Tandy (whose Color Computer already contains a Motorola chip set) would release a 64-color computer. They denied it all as usual. But you can tell. There's a prototype or two somewhere. . . .

Now at last for the reviews I promised last month. I've taken a look at two disk operating systems for the Color Computer. The first is ADOS from SpectroSystems. The second is Spectrum DOS 1.0 from Spectrum Projects. The products share many similarities, but I'll go over each one separately rather than comparing side by side.

Table 1. Features of ADOS.

- Repeat and edit of last direct-mode command.
- Control key abbreviated entry of Basic commands.
- Automatic line number prompts for program entry.
- Lowercase command entry.
- DOS command for booting OS9.
- One- or two-column directory, with free granules. (Screen or printer).
- COPY <filename> TO <drive number>.
- AE error override option for COPY and RENAME.
- RUNM command to load and execute a machine language program.
- RAM command for ROM-to-RAM transfer (64K access).
- SCAN command lists ASCII file to screen or printer. Gives start, end, and exec addresses for binary file.
- PRT ON/OFF enables/disables routing of text output to printer as well as screen.
- Mini-monitor provides hexadecimal memory examine and change capability.
- PEEP command provides movable window for viewing memory contents.
- High-resolution text screen driver included as an additional utility (42, 51, or 64 characters per line, with lowercase).
- Customizing utilities included enable definition of your own control key abbreviations, printer baud rate, disk step rate (6-30 ms), tracks per disk (35 or 40). Double sided drives supported.

ADOS

First, ADOS which describes itself as "an enhanced, ROM-able Disk Basic for the Radio Shack Color Computer, 64K required for RAM use." The statement about RAM use is interesting in itself. As the regular Tandy DOS is contained within the plug-in ROM cartridge at the side of the computer, there are two ways in which a new DOS can take over. The first involves switching to a memory map whereby 64K of RAM is addressed. This 64K contains the new DOS. The other way is to extract the ROM from the disk controller ROM pack and insert a different ROM containing the required DOS. So ADOS can be implemented either from RAM in 64K mode or from ROM if you have the ability to get an EPROM burned in. The ADOS manual gives addresses of two services that can do the EPROM programming for a mere $20 including the chip.

Brief descriptions of ADOS features are listed in Table 1.

Also included on the latest version of ADOS is an ERROR command which provides error trapping within Basic. The manual for ADOS consists of 11 pages of clearly written text which I

thought was OK. This isn't glossy magazine stuff. It is a concise description of the DOS commands and how to use them written for someone who already understands Tandy's DOS.

I liked the repeat-command feature. I wish all operating systems (disk or otherwise) had this facility. How often have you typed in a long command line only to have the computer throw it back at you for a single typo? ADOS lets you edit the last command line using the Basic line editor. Simply entering a slash brings up the entire last line input with the edit mode invoked. You simply correct any typos and press Enter. The command is then handed back to the computer as if you had retyped it. This is a nice feature.

I found the lowercase entry of commands to be another nice feature which worked well with my lowercase mode. I use Dennis Kitsz's lowerkit and constantly find myself in lowercase simply because it is less ugly than the Tandy inverse uppercase. Hence, the computer keeps complaining about syntax errors just because of the case I happpen to be in while typing. ADOS brings some sanity back to that scenario by happily working in either case.

For those of you who are still limping along in uppercase only, a high-resolution text screen utility is provided. This lets you choose 42, 51, or 64 characters per line. I wish 32 characters per line had been included so you could have a simulated low-resolution lowercase driver. However, this is only a barebones utility which doesn't react visibly to a CLS command or the Clear key.

The PRT ON/OFF command, which lets you concurrently send output to both screen and printer, is another goody. This is always useful. You can capture the printed output of an entire program without having to change all the PRINT statements to PRINT #-2 statements. The PRT ON option is apparently used when using the DIRP and CATP commands. DIRP sends the output of the DIR command to the printer and CATP sends the output of a CAT command to the printer. DIR is the same as the Tandy DIR command except that the number of free granules is printed at the end. CAT gives a two-column directory, letting you get more information on a single line. Using CATP gives a printed directory suitable for attaching to a disk envelope.

The reason I say that DIRP and CATP both invoke the PRT ON command is that if you hit Break during the output of the directory, you must type PRT OFF to disable the printed output. I don't like that. I think it is the responsibility of the operating system to deal with such situations.

A similar situation arises when the SCAN command is used. This lets you list the contents of an ASCII file or gives you the addresses involved with a machine code file. However, interrupting a file scan with the Break key requires a CLOSE command to be issued to avoid a subsequent AD error. This is only a minor problem, but it seems such a pity to allow the hard work involved in writing a DOS to be compromised by simple Break-key trapping. (Maybe previous Tandy Gram columns will help!)

The last thing I'll have room to discuss is the monitor command. Invoked with the MON command, this lets you examine and change memory in a manner similar to the ZBUG monitor that comes with the EDTASM+ assembler from Radio Shack. Many operating systems are equipped with facilities for debugging and this simple version makes up for the omission in Tandy's DOS.

Table 2. Spectrum DOS 1.0 commands.

DOS: Works like the one in 1.1 Disk Basic.
ERROR: This is ON ERROR GOTO.
FLEX: Boots Flex with ease.
RUNM: Loads and executes machine code programs.
PEEK: 16-bit version of PEEK.
PPOKE: 16-bit version of POKE.
AUTO: Automatically issues line number prompts.
INVERT: Inverts subsequent output (lowercase).
NORMAL: Reverts output after INVERT command.
WAIT: Automatic timed pause command.
LMOVE: Copy and delete Basic lines.
RATE: Set drive(s) seek rate.
TRACKS: Sets the number of tracks per drive.
HELP: Lists all new commands.
HDIR: Hardcopy directory.
HIRES: Gives hi-res 32, 51, or 64 characters per line.
OLD: Undoes NEW command.
FKEY: Up to nine programmable keys.
LCOPY: Copy Basic line.
BREAK: Disables the Break key.
MEMO: Full screen editor and screen dump.
FLIP: Inverts the screen.
EXIT: Returns to normal text screen.
ECHO: Output to printer concurrently with screen.

Spectrum DOS 1.0

Next on the agenda is Spectrum DOS 1.0. This has many similarities to ADOS in that Radio Shack compatibility is maintained, some of the commands provide the same features (even using the same command names), and it, too, can be burned into an EPROM. Customizing utilities are also provided. The rundown of Spectrum DOS 1.0 commands is shown in Table 2.

First, a word about documentation. The manual is not a strong point, I'm afraid. I would never have dared turn anything like this over to my English teacher. Phrases like "bingo your in Spectrum DOS," "without the lose of your program," and "a inverse F" tend to lessen my confidence in any product no matter how high its apparent quality. Also, at a mere six pages, this DOS is ill served by its manual. A little more discussion of some of the commands would serve both to illustrate and encourage their use.

One thing I do like about this DOS is that it automatically searches all drives when looking for a program. I shouldn't even have to comment on a feature such as this which should be standard in any DOS whether it be for a Cray, a Color Computer, or a programmable calculator. Tandy was not thinking when they left it out. Spectrum DOS also lets you use any number of tracks on your drive so you can hook up an 80-track drive if you wish.

Along with other enhancements to life in the direct mode, DOS 1.0 lets you redefine both the cursor character and the READY prompt. A keyboard repeat feature is part of the package; to repeat a key, simply hold it down and the character shifts to second gear.

The high-resolution text screen is well integrated into the DOS. It doesn't feel like a separate software driver. The Clear key and the CLS command both work properly, and it is simple to revert back to normal low-resolution graphics with the NORMAL command. The Basic PRINT @ command is extended to work in any print density. However, no check is made for a PRINT @ where the character is off the screen, and I did manage to crash the DOS when I tried a PRINT CHR$(129) followed by EXIT to lo-res then LIST.

The LMOVE and LCOPY commands add a nice feature to Basic. Both commands allow you to copy Basic lines from one part of a program and place them in another. LMOVE deletes the old

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lines, whereas LCOPY leaves them intact. Another nice command is OLD. Have you ever had that flash of panic when you typed in NEW and realized you hadn't saved the program first? Nasty isn't it? Salvation is at hand with the OLD command. As long as you don't add any line numbers after your NEW command, OLD will restore the program you absent-mindedly erased.

The PRT ON/OFF command, which lets you concurrently send output to both screen and printer, is another goody.

Finally, I'll mention the HELP command. This is another command that should be available in any "real" DOS. Typing HELP brings to the screen a display of all the new commands along with the required syntax for their use.

Summary

Both of these disk operating systems have much more to offer than I have room to cover here. As for which one is better, I find it difficult to decide. Spectrum DOS 1.0 may have a slight edge, but I'm not comfortable with the thought that I could crash it so easily. ADOS stayed intact during my wild forays into its commands. A scan through the features of each DOS versus your own particular requirements will be your best guide.

The manual of Spectrum DOS 1.0 ends with a quaint quote which I can't resist passing on as an epilogue:

"Every precaution has been taken to assure that this program is error free, but there is no program in existence that it totally bug free. So if one is encountered please let us know." So folks, if you find a bug-free program. . . . ■

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COMMODORE'S PORT

The Commodore 128 PC

Sheldon Leemon

The new Commodore 128 is a powerful upgrade of the highly successful Commodore 64. In it's attempt to serve the broad range of needs found among users of low-end personal computers, Commodore has actually created three computers in one. The 128 has all of the features of the 64 and can emulate it exactly. In addition, it has a 128K super-64 mode, with over 119K of RAM accessible to Basic programmers, a new Basic interpreter that fully supports the machine's sound and graphics capabilities, an extended keyboard, and an 80-column color or monochrome display capability built in. Finally, there is a separate Z80 processor, which allows the use of standard CP/M software (the machine comes equipped with CP/M Plus Version 3.0). This new machine also improves the slow disk drive access time that plagued the 64, and made it less than satisfactory for business use. When used with the new 1571 disk drive, the 128 will perform Commodore-style disk I/O five times faster than the 64, and is over ten times faster in CP/M mode.

Physically, the 128 is a sleek machine with a low profile and an attractive, dramatically styled white case. It is a little wider than the 64, not quite as high, and almost twice as deep. The backplane extends so far back beyond the keyboard that it is almost possible to stand a monitor on it. The core of the new keyboard is a 66-key duplicate of the 64 keyboard. Off to the right side is a 14-key numeric pad, and along the top row are groupings of new keys, including separate cursor, ESC, TAB, ALT, CAPS LOCK, HELP, LINE FEED, 40/80 DISPLAY, and NO SCROLL keys. On the right side of the unit are two joystick ports, the on/off switch, and a reset button. The port connectors on the back of the unit are identical to those on the 64, with the addition of a second video output, to be used for the new 80-column display to either an RGBI or high-resolution monochrome monitor.

To get an idea of the capabilities of this new machine, let's examine its three modes. First is the Commodore 64 mode. Since by this time the features of the 64 are fairly well known, there is no need to go into much detail here except to say that when the 128 is in 64 mode, the machine is 100% compatible with the 64. How compatible is it? So compatible that you can't even switch back to 128 mode without turning the computer off, since when in 64 mode it has no access whatever to the memory management chip (which of course is not present on a real 64). So compatible that when in 64 mode the computer cannot read the additional keyboard keys.

Compatibility may be reduced somewhat when the machine is used with the new 1571 drives. Though the drive behaves as closely as possible to a 1541, there may be slight differences that will confuse some of the more exotic copy protection schemes. Commodore has stated that it will help manufacturers cure even these rare cases of disk incompatibility. In short, unless a program is doing something incredibly bizarre, it will load, and if it loads, it will certainly run.

Next, we move on to 128 mode. This is the mode in which we find the machine on power up. The first thing you see is a message telling you that Basic version 7.0 has 122365 bytes free. In this mode, all of the features of the 64 are retained, but there are several new features as well. First of all, in this mode the entire extended keyboard is operative, and since the key assignment table is stored in RAM, any or all of the keys can be redefined. The C128 has a greatly expanded 48K ROM Operating System (three times as big as that of the 64). Of this, approximately 16K consists of the Kernal Input/Output and advanced screen editor routines, and 32K is devoted to the Basic language and a full machine language monitor. Many of the new features are very similar to those found in the ill-fated Plus/4 and the B128, such as an advanced screen editor (which includes such features as line insertion, line deletion, and margins at the top, bottom, and sides of the screen).

The Basic interpreter, version 7.0, has all of the features of every previous Commodore Basic and then some. It features the full range of disk commands supported by Basic 4.0 found on the CBM business computers and all of the music, hi-res, and sprite graphics commands found in the Super Expander car-

tridge. To these, it adds a number of miscellaneous commands from Basic 3.5 on the Plus/4, including Basic utilities such as automatic line numbering, renumbering, and block deletion, a powerful PRINT USING command for formatting output, and some structured programming constructs, such as BEGIN, BEND, DO, LOOP, WHILE, UNTIL, and EXIT.

In at least one respect, however, the C128 differs from every previous Commodore machine. Upon power-up, the computer checks the disk drive to see if it contains a special auto-booting disk. If it does, it will load and run the program (either a named file or a range of sectors of the disk) that is indicated in the boot sector of the disk. This feature, previously found on almost every other home computer, allows the creation of applications programs that can be easily used by those unfamiliar with the operation of a computer. Similarly, the Basic command RUN has been changed so that the command RUN "PROGRAM" will load and automatically run the named program.

One hardware difference between the 128 and the 64 is the memory management chip that enables switching between the various modes of operation. It also allows the use of 128K of RAM and up to 112K of ROM memory by a microprocessor that can access only 64K at a time. In fact, the memory management system can handle up to 512K of RAM, although the extra 384K can be used only as a super-fast RAM disk. Such a RAM disk add-on unit was hinted at by Commodore officials, though they made no actual product announcement.

Unlike a simple bank selection process that allows the software to flip between two banks of 64K at a time, the new chip allows you to do such things as select common areas of memory that will be shared by the different memory banks. The memory management chip also allows you to designate more than one color RAM area. This makes it easier to keep multiple screens of display data in memory and flip from screen to screen.

Machine language programmers will appreciate the fact that this chip will allow them to set up multiple zero page and stack segments. In addition to the built-in ROM and RAM, the memory management allows up to two 32K application programs in ROM. Such ROM programs can be added as special 128 cartridges. These cartridges operate like the Plus/4 "function key" cartridges. On power-up, the computer checks to see if any such cartridges are present, and if any are, they can take control briefly and hook themselves up to one of the function keys, which can then be used to start the cartridge program.

The engineers demonstrating the new computer at the Consumer Electronics Show in Las Vegas said that the machine also has an empty IC socket that could be filled with up to 32K of application program or system ROM, making that application or system program available to the user on power-up. Proposed uses for that ROM space include advanced DOS support, drivers for a mouse controller, and RAM disk software to support proposed memory extension modules. As of this writing, the question of what ROM will be added is not yet settled, but it seems fairly certain that some little "goodie" will be thrown in.

In addition to the 40-column VIC display chip found on the 64, the C128 has an entirely separate 80-column display controller chip, similar to the one used by the IBM PC. This chip provides output for a full 80-column RGBI 16-color display with 640 x 200 resolution. This display can also be viewed on a high-resolution monochrome monitor. Since the 40-column and 80-column display systems are completely separate, it is quite possible for a program to generate two completely different displays at once.

Or, it is possible to shut off the VIC chip completely, and only use the 80 column display. When this is done, the clock speed of the system is doubled to 2 MHz, because unlike the VIC chip, the new CRT controller does not share RAM with the processor. It has its own 16K of memory, which the processor can access only via the video chip. All of the text characters on the 80-column screen are in effect bit-mapped, using a standard character set that is downloaded to its screen memory. Since the character data are in RAM, an unlimited variety of user-defined characters can be downloaded and displayed on the 80-column screen. This makes it possible to display high-resolution graphics in a 640 x 200 format, as well as text. The major limitation is speed since the main processor cannot read display memory directly, but must go through the display controller chip. While this probably lets out hi-res animation, quality business graphics are perfectly feasible.

There are two other minor, albeit very useful hardware additions to the Plus/4. The first is a Reset button located on the right side of the case next to the on/off switch. This allows you to recover from a software crash without disturbing the contents of memory. The other change is to the serial port, which is now connected to the CIA chip hardware serial register. This means that while the disk drive still uses a serial, rather than a faster parallel connection, at least the C128 does not have to rely on slow software handshaking for its serial transfer. The older 1541 disk drive can still be used with the 128, but the computer cannot make use of the faster transfer rate when connected to it.

If these were the only additional features that the C128 had to distinguish it from the 64, it would still be a distinct step up. But on top of all of these new features, the 128 is a complete CP/M machine. Using a Z80A microprocessor, the 128 runs CP/M Plus Version 3.0, which is supplied with the computer. The clock speed of the Z80 is given as 4 MHz, but the engineers state that the effective speed of the system is probably closer to 2 MHz. Although the 80-column display is more in keeping with the requirements of most CP/M programs, the Z80 also has control of the VIC chip with its colorful sprite graphics, and the musical capabilities of the SID chip.

The system boots CP/M from a Commodore formatted disk, but once activated it can use the 1571 disk drive to load programs and read data in standard IBM System 34 format (used by computers like the Kaypro and Osborne). Under software control, the drive can also emulate other CP/M formats. In CP/M mode, the 1571 drive stores up to 410K of data and has a transfer rate almost 12 times as fast as the 64 drive. Thus, the machine provides access to the entire CP/M software library, without requiring you to convert the software to any particular disk format.

With the C128, Commodore seems to have addressed all of the deficiencies of the 64 that might have disqualified that machine as a serious, general purpose computer. A faster disk drive with greater storage capacity has been added, and an 80-column display provided. To the already massive home software library of the 64, this machine adds the enormous CP/M library, which features time-tested software for every type of business application. Thus, in its versatility this machine rivals, and perhaps surpasses the Apple II, at a price very close to the current level of the 64.■

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CIRCLE 131 ON READER SERVICE CARD

OUTPOST: ATARI

New computers and peripherals; Plato; rumors

David Small

While sales of the Macintosh have not approached those of the IBM PC, there is another factor to be considered in assessing the popularity of the two machines: more people use—really *use*—Macintoshes than use IBMs. The PC to me represents the Bad Old Days of Computing, complete with disk operating systems, file allocation tables, and other bits of tripe that made computers difficult to use and all but impossible to learn to use. So you tend to find IBM machines dedicated to one application (most commonly, *Lotus 1-2-3*). Macintosh users, in contrast, tend to use their computers in widely varied ways; the Mac is a natural for many applications.

Wait a minute . . . this is the Atari column, right? Why am I raving about the Mac? Ah, the Mac is a great idea with one sticking point: the price. Right now, the best price you can get for a Mac is around $1600, and that is for the 128K, Skinny Mac. To get the most out of the Mac, you need the 512K machine, which will run you $2500 (if you shop around). This is just too much for a computer "for the rest of us."

Tramiel's Surprise: The New ST line

Now enter Jack Tramiel, who darn well knows a good idea when he sees it (like the Mac's user innovations) and also knows how to build an inexpensive machine (like the Vic 20 and Commodore 64).

And witness, a very few months later, the Atari 130ST and the 520ST computers with Macintosh-like capabilities. The (projected) price? For the 128K machine, called the 130ST, $400, not $1600, as for the Mac. And for the 512K machine, the 520ST, an incredible $600, not $2500.

When these prices became known, many computer experts said, "great, if he can do it." This is a disguised compliment to Tramiel; had anyone else in the industry announced machines with these capabilities at such prices, we would have heard a flat "it can't be done."

The machines feature an operating system (the part of the computer that deals with you) called GEM. If you have ever seen a Macintosh, you have seen GEM. If you haven't seen a Mac, check out our July 1984 review.

The Atari machines feature a mouse and the desktop concept implemented in color. What does this mean to you? The new Atari machines will be very easy to learn how to use. They will have the ease of use of the Macintosh at a price long associated with the Atari name.

> **Had anyone else in the industry announced machines with these capabilities at such prices, we would have heard a flat "it can't be done."**

Atari's 130ST and 520ST use the Motorola 68000 microprocessor, a fast and efficient chip, and clock it at 8.0 MHz, which is really fast. The 68000 is a joy to program; if you already know 6502 or 6800 assembler, you will find the transition easy. The 68000 has the genius of a simple instruction set with many options for each instruction. This keeps the number of available instructions manageable.

The 68000 is faster than the IBM chip for two reasons. First, it is clocked much faster (8MHz vs. 4.77 MHz). Second, the 68000 talks to the world 16 bits at a time; whenever the IBM has to communicate, it does it in two 8-bit pieces, which slows it down considerably. The 68000, by the way, is the same chip Apple picked for the Macintosh.

By the way, the current Atari chip runs at 1.79 MHz and is 8-bits only. That is a speedup of four times in clock rate alone. Now add the doubling of 16-bit operations and the overall efficiency of the 68000 . . . and you thought your Atari was fast!

Both of the new ST machines have color video with several modes: 320 x 200 in 16 colors (roughly the same as the current Atari machines), 640 x 200 in four colors (like graphics 7 with much higher resolution), and 600 x 400 in one color (like graphics 8 with much higher resolution). Atari will sell you an RGB color monitor (XC 141) to use with these machines for around $320 (640 x 200) or a monochrome monitor (XM-128) for the 640 x 400 one-color mode for around $170.

The machines are said to have both Centronics parallel and RS-232 serial ports built in; that means that no extra interface is necessary for these machines. (A sigh of relief is heard).

Peripherals

The disk drive for the ST line (SF 354) will be the 3.5" type so familiar to Mac users. It has 500K of storage; the 810 and 1050 have 88K and 128K, respectively. The price, however, may knock your socks off—$100 for a drive. Thus, we are talking about a powerful Macintosh-like product for under $500, complete with disk drive. There is also mention of an SH-317 10Mb hard disk, but no price is mentioned.

Right now we can dispense with two common questions. Will the new Atari machines run IBM software? No. Will they run the old Atari software? No, but . . .

The reason I qualified the second no is that Atari announced two other new machines which are "100% compatible with the XL line of computers." They are the 65XE and the 130XE. The 65XE

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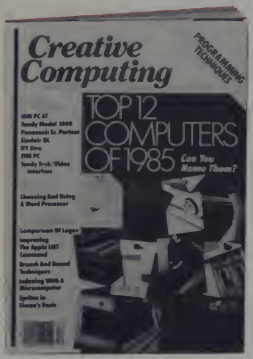

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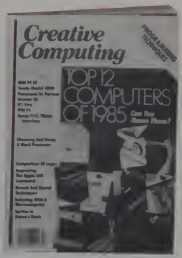

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Heath/Zenith	E	P
IBM	F	Q
Radio Shack/Tandy TRS-60	G	R
Texas Instruments	H	S
Timex Sinclair	I	T
Other (specify)	J	U
None	K	V

3 For what, if any, business application(s) do you use the microcomputer you currently own?_____

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has 64K of memory, and the 130XE has 131K.

The New Old XE Line

These are Atari machines that you will know and be comfortable with immediately; the primary changes are internal to cut production costs. One difference you will note immediately is that the "parallel expansion bus" that used to be on the 800XL machine is gone on the 65XE; it will be present on the 130XE, however.

The 6502 processor used in these machines is the same fast, reliable chip used in the previous Atari lines. However, it is given 131K of memory to access in the 130XE model, which offers potential for higher speed and more memory-intensive applications. (Remember, though, that the 6502 cannot access more than 64K directly at any one time; the other 64K is accessed by temporarily turning off a piece of the "regular" 64K memory and turning on the "alternate" 64K memory instead.) Also bear in mind the "numbers game"; normally, a machine with two sets of 64K dynamic memory chips is called a 128K machine, as in the 128K Macintosh or 128K Commodore. In reality, the memory (in decimal) comes out to 131,072 bytes—so Atari one-upped the competition and named the new machine the 130XE, to get a number slightly higher than theirs—typical Tramiel competitiveness, and who knows how much difference it might make to a computer neophyte purchasing a machine? And, of course, the 512K machine is advertised as the 520ST.

The 65XE machine will cost around $100, which is the current price of the 800XL, and the 130XE machine will sell for $200. These prices seem likely to undercut the competition (Commodore) by some 50%.

Also announced was a portable computer with 128K and the same 6502-XL compatibility, called the 65 XEP. Complete with a built in 3 1/2" disk drive and color monitor it sells for around $400.

What about peripherals? There are many. I have mentioned the 3.5" disk drive for the ST series. But the most exciting is a promise of a $400 15Mb hard disk for the ST line by June. That's right, $400. Apparently the ST machines already have a hard disk controller (the expensive part of a hard disk) already built in.

New printers include the XTM 201, XTC 201, and XMM 801, inexpensive dot matrix printers with both color and non-impact versions, running at 20, 20, and 80 cps respectively. The XDM 121 is a 12 cps letter quality daisywheel printer.

Projected shipping dates? April 1 for the XE line; May or June for the ST line.

Rumors

Digital Research has apparently been working with its GEM (Graphics Environment Manager) operating system for a while; GEM works with CP/M-68K, DR's operating system for the 68000 chip. Tramiel had been carrying on discussions with DR for quite some time about this and decided to implement his ideas with his new Atari Corporation.

There was some mention of the Mindset computer being added to the Atari line. Apparently the story was that the new machines were not "brought up" at Atari until three days before the Consumer Electronics Show. So the Mindset was "held in reserve" as a 16-bit color computer in case the 130ST and 520ST didn't pan out. Sounds like the Atari engineers put in a lot of overtime. Bringing up a 68000 prototype computer in six months is astonishing speed.

I've been on Plato since 1978 and highly recommend you look into it.

Very hot rumor: the ST series will be able to run Mac software. (For those of you who are knowledgeable and point to the copyrighted Apple ROMs (prestored programs) that are part of the Mac, remember the MacWorks package for the Lisa has this same information on disk.)

Another hot rumor: The ST may be able to read Mac disks directly.

A final hot rumor: You'll probably find CP/M-68K available for the ST line very soon, which means there will be fast, efficient Pascal, C, Fortran, CBasic, and such available.

Plato

Also worthy of mention is that the Plato cartridge for the XL series of machines is being released finally. If you have been looking for an easy-to-use communications net and for a place with some high quality educational software (100,000 contact hours), it would be a good idea to check out Plato. Plato is a mainframe computer in Minneapolis that has been around for ten years with an astonishingly good selection of courseware—everything from math drills and sentence structure for kids to how to fly a 747 (a simulator that United Airlines uses). The Plato Learning Phone, designed by two software engineers at Atari, Vince Wu and Lane Winner, lets you access Plato for $7.75/hr. (local phone call)—a rate competitive with CompuServe and The Source, certainly. You need either a Microbits 300/1200 baud modem (the 1200 baud modem ought to be announced by the time you read this) or an 850 interface and anyone's 300 or 1200 baud modem.

I've been on Plato since 1978 and highly recommend you look into it. It takes the term "user-friendly" to new heights and is the first computerized society.

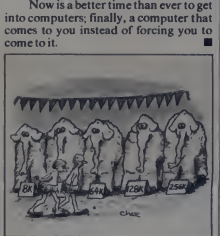
Infinity

Atari has also announced a $49.95 software package which is said to compete favorably with *Lotus 1-2-3*. The price is an indication of another Atari promise: "We won't sell software for over $50." There will be more on *Infinity* in a later column, rest assured.

Conclusion

What does this mean for new computer users? I believe that Atari finally has created what Apple always advertised: "The Computer for the Rest of Us." It has the innovative, easy-to-use Macintosh user interface but none of the high Macintosh pricing.

Now is a better time than ever to get into computers; finally, a computer that comes to you instead of forcing you to come to it. ■



IBM IMAGES

Mini-Reviews of nine useful products

Will Fastie

Keeping up with all the new products that pop out of the woodwork, and some of the old ones, is a formidable chore. I try to spend part of each working day trying something new. Now to some of you, that might sound like the nice part of a job, and I do often find myself enjoying that time. It is also quite a pain—especially when the product ain't so great, or when figuring out how to use it consumes more time than the product is likely ever to save. Mini-Reviews (tm W. Fastie) are my way of calling your attention to some things I have seen.

I know that there are many very fine products out there. In my mini-reviews here, I don't mean to slight any product which competes with the ones mentioned. These are just some that I have used and think deserve a mention.

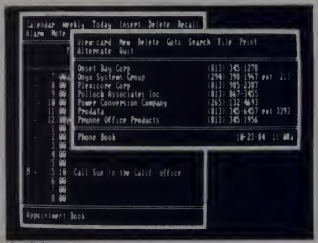
There are also some rotten products around, and I have in the past been utterly fearless in my condemnation of them. It is a happy feeling to be able to say that I can't think of any recent product that is so bad that warnings about it are urgent.

Spotlight

Software Arts' new product is that company's first attempt to deliver a program of mass appeal since *VisiCalc*. *TK!Solver*, powerful and useful as it is, only piques the interest of a narrow segment of the user market. *Spotlight* has broader appeal: it is a useful, thoughtful program, and distribution agreements with IBM and Computerland should ensure wide availability.

Spotlight provides six functions: calendar and appointment management, phone directory, index card files, note pad, calculator, and DOS shell. The functions load into memory and are available at the touch of a key, regardless of the program currently in progress (and assuming enough memory is available at that moment). Because the *Spotlight* supervisor program must reside in memory, and because each "accessory" program is loaded as required, a lot of memory is helpful. *Spotlight* will be faster and more useful on systems with hard disks; although this at first seems to limit the appeal of the program, the number of hard disk-equipped systems is rising as the cost of the hard disk plummets.

I have found the appointment calendar to be superb, rich in features and easy to use. It is the accessory I use most frequently. What really sold me on it was the speed at which I am able to use it while talking on the telephone. I can quickly update my schedule, find conflicts, or make notations for days in the immediate future or days far away. A particularly nice feature is the weekly schedule, which allows regularly scheduled appointments to be noted once but posted automatically to every week. Alarms can be set, and the program keeps and displays meeting durations. The appointment book is not restrictive: it can schedule for any time (as opposed to just quarter-hours, for example).



Spotlight

For a novice user, the DOS shell program, known as the DOS Filer, is a useful and intelligently constructed utility. I have experimented with it, but use it infrequently because my DOS knowledge is sufficient to allow efficient use of DOS commands.

The phone directory, and a similar card file, are simple data managers for small files. I use the phone book; I have not found a use for the card file. I can think of many, such as client, vendor, or customer files. Because more than one phone book or card file can be maintained, quite a bit of data can be stored with this facility. The newest version of *Spotlight*, update 1.1, allows automatic telephone dialing from the phone book, a nice touch.

Spotlight does need more work before it will really catch on. It is weak in the printing department, resorting to simple printing techniques similar in style to those of the original *VisiCalc*. It needs to provide margins (all around) and print page numbers, for example. I also think more work is needed on the appointment book before it can completely replace my Day Timer, but it is close enough now that I am committed to using both. Its price of $149.95 is a bit steep given these weaknesses, but I am hopeful. Software Arts needs a winner, and this could be it with a little more tuning.

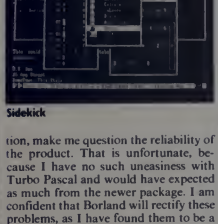
Sidekick and Higgins

The most talked-about competition for *Spotlight* is *Sidekick*, from Borland International (creators of Turbo Pascal). I have very mixed feelings about *Sidekick* because even though it has nice features and a reasonably thoughtful design, I do not trust it.

Frankly, I think *Sidekick* is still a little "buggy," and I have two recent complaints. In the first case, DOS was unable to find a file on a disk after *Sidekick* had been installed, but had no diffi-

culty without *Sidekick*. This problem, in particular, makes me think the program is not behaving properly. Second, *Sidekick* does not deal with all modes of video display; some images are garbled when *Sidekick* begins to run, although they are properly restored upon exit.

I have heard several complaints from other users, most having to do with programs with which *Sidekick* will or will not run properly. My own experiences, in concert with this other informa-



Sidekick

tion, make me question the reliability of the product. That is unfortunate, because I have no such uneasiness with Turbo Pascal and would have expected as much from the newer package. I am confident that Borland will rectify these problems, as I have found them to be a responsive and responsible company.

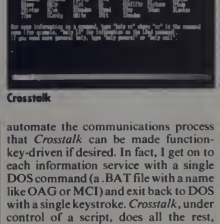
Higgins is a *Spotlight*/*Sidekick*-like product which I have not tried myself; I have only been able to watch the self-running demo. If the human interaction of *Higgins* is on a par with that of *Spotlight* or *Sidekick*, it promises to be a formidable competitor. Its notable feature is the way in which it cross-files the information. A posting to the appointment book might, for example, make a notation in a project file, or in a file about a person.

Higgins appears to be maintaining its information in a more complex file than the other products. So I'll have to reserve judgment because that added complexity might serve to make the program cumbersome and slow. I'll report back when I have tested it more fully.

Crosstalk

There can be little question that MicroStuf's *Crosstalk* is the most popular communications program—and with good reason. It is flexible, powerful, and it has an above average human interface.

Arguments will continue to rage about programs which are menu-driven vs. command-driven vs. function-key-driven. *Crosstalk XVI* is command-driven, which seems to be the least favorite alternative nowadays. But the command-driven nature of the program also gives it its most powerful and useful feature: programs (called "scripts" in *Crosstalk* lingo) can be written with the same commands used to run the program interactively. These scripts can so



Crosstalk

automate the communications process that *Crosstalk* can be made function-key-driven if desired. In fact, I get on to each information service with a single DOS command (a .BAT file with a name like OAG or MCI) and exit back to DOS with a single keystroke. *Crosstalk*, under control of a script, does all the rest, including the log-on sequences.

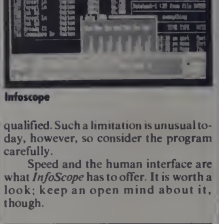
Crosstalk scripts are flexible. They can handle just about everything that might come up during an on-line session. The new version, 3.5, includes many improvements as well as a script file that automates the process of defining your personal log-on scripts for the most popular on-line services.

Lesser known features of *Crosstalk*, such as its ability to answer the phone and act as a host, even including password protection, round out this versatile program. I think it is the program of choice for anyone with serious communications needs, and its more powerful features allow it to be used as a communications programming language.

InfoScope

Another product from MicroStuf is *InfoScope*, a data management program. Like *Crosstalk*, *InfoScope* has good qualities of interaction with the user. My reason for mentioning it here, though, is the speed with which it operates.

I know of no faster program. Sorts and searches happen almost instantly—



Infoscope

a surprise if you are used to more conventional data managers. In fact, *InfoScope* is so fast that one is given to think that there might be a catch. There is.

InfoScope gets most of its speed by keeping all the data in memory at once. This obviously limits the size of a data file, and *InfoScope* is thus best used when the number of records is relatively small. There are certainly many filing jobs that require a limited number of records, so this program is not automatically disqualified. Such a limitation is unusual today, however, so consider the program carefully.

Speed and the human interface are what *InfoScope* has to offer. It is worth a look; keep an open mind about it, though.

Nutshell

Of all the data management packages I have tried over the past year, none has impressed me quite like Nutshell. It has some features that are unique, a flexible reporting capability, and a spiffy user interface.

The two features that distinguish the program are its ability to deal with text and the fact that all fields are indexed. The first might seem trivial, but I know of no other program that handles text as nicely. Most data managers limit a field in a record to a single line, sometimes up to 255 characters. Lately, some programs have emerged that can handle text fields of 4000 characters or so. *Nutshell* allows text fields to be 65,000 characters long but, more importantly, allows them to be displayed as arbitrary rectangles on the screen. Within the rectangle, *Nutshell* acts like a tiny word processor, wrapping the lines as the user enters text. If the text is changed, the new text reformats within the field.

The indexing feature is the main selling point of *Nutshell*. One of the major problems with data management sys-

tems is that so much time must be spent designing a file, organizing screen displays, and deciding how records will be retrieved. Retrieval issues are the most complicated, because the user must generally decide which fields will be used as keys. *Nutshell* eliminates this requirement by indexing everything. Records can be found by specifying any value in a field; retrieval is very fast and is not dependent on the file size.

There is another, more subtle value inherent in the indexing scheme. Because the user does not have to specify keys, and because everything is indexed, records can be retrieved based on criteria that were not even considered when the file was originally created. In many other filing systems, such a change of retrieval criteria forces a major overhaul of the design of the particular file.

Because everything is indexed, *Nutshell* does exact a file size premium. But for those applications requiring text management within the filing system, *Nutshell* shines.

Paradise Modular Display Adapter

Many PC owners are faced with a problem: Having started with an IBM monochrome display and IBM adapter, what is the best way to step up to graphics? There are several good answers to that question. The Paradise Modular Display adapter is a recent answer that offers both short- and long-term solutions on a single board.

The short-term solution is the acquisition of the Paradise card. For the first-time PC buyer or the owner wishing to upgrade from IBM monochrome text to graphics, the Paradise card offers the least expensive way to obtain graphics capabilities. Furthermore, the door is left open for the longer-term solution of adding a color display, because the Paradise board can operate either an IBM Monochrome display or a standard RGB display.

Paradise has put together a software and hardware product that is actually a color graphics card in disguise. Understanding this fact is vital to understanding the value of the device. First and foremost, the MultiDisplay board is completely compatible with the IBM Color/Graphics Adapter and thus will run any program that works with that standard. Or, to speak directly, just about everything. Other boards that deliver graphics to the monochrome display have a graphics resolution that is higher than the IBM standard, but those boards also require a software program to have a special driver. If *Lotus 1-2-3* doesn't have a driver for your SlipShod X23 display board, you're just out of luck. On the other hand, Lotus knows all about the IBM standard.

Second, the board is able to represent all 16 colors with different shades of green (or amber on some displays). Flying the Microsoft *Flight Simulator* is not beautiful on Paradise, but it is perfectly playable.

If you have a PC and monochrome display, or if you are just now looking at one, the Paradise board may make your investment all the more worthwhile by economically expanding the display technology without sacrificing the future.

Turbo Pascal

And now, another word about the product that put Borland International on the map. I won't belabor the point (I'm sure you've heard of Turbo Pascal from any number of sources).

Turbo Pascal is, of course, the software bargain of the century. Borland may be doing more to popularize Pascal than anything that has gone before. In fact, *PC Tech Journal* (that's where I work) has not received unsolicited article, about C for some time, while articles about Turbo just continue to pour in. I think we are going to see a lot more people using Pascal as their primary language, and I think it's all due to Borland. By the way, the company claims to have shipped over 200,000 copies of the language.

Turbo Toolbox is a recent product from Borland that includes an ISAM file manager, a sorting program, and a special utility program. I am just now writing a program to try the file manager, and I have heard very positive things about it. I have not tried the general installation program (GINST) or the sorter. There are technical issues surrounding sorting that make a close look necessary before a recommendation can be made, but it's hard to see how you can go wrong for $49.95.

Turbo Tutor is a new product from Borland that rounds out the Turbo Pascal family. It is a book and a diskette full of routines and small programs, some of which are useful additions to a Pascal library. My brother, a novice programmer who does not know Pascal, was given all the Turbo Pascal products for Christmas; we'll see how he fares as a test of the *Tutor*.

WordPerfect

Finally, a word about an old friend of mine. *WordPerfect* is now available in Version 4, and it is something to behold. There are too many new features to list here, but among the more impressive are the new dictionary and the indexer. *WordPerfect* also gained a facility for maintaining a table of contents and up to six other tables, such as a list of figures. There's much more.

I know I must sound like a broken record on this subject. In a future column, I will discuss *MultiMate* and *Wordstar 2000*, as well as some of the other products in the genre. *MultiMate* has evolved quite a bit since I tested it several years ago, and deserves a new look. *Wordstar 2000*, of course, is MicroPro's all-new revision of *Wordstar*; we could hardly pass it up.

I hope these brief looks at a few of the most interesting products prove helpful. ■

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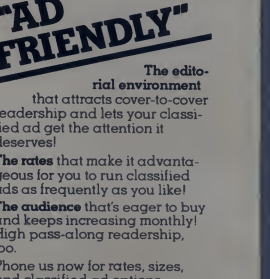
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